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THE ARCTIC CAMPAIGN OF 1874.

As season after season passes away without seeing the despatch of an English Arctic Expedition of discovery, the reasons for resuming our proud old position as leaders in Polar enterprise become stronger and more urgent, and the motives which should induce our rulers to comply with the wishes of the nation accumulate in weight and strength. Every year the advances that are made in various branches of science make the ignorance of those facts which would be investigated by an Arctic Expedition more felt, and thus enhance the importance of collecting them. Every year the value of the whaling trade increases, and with it the necessity for examining thoroughly the vast unknown area, and for taking stock of the treasures it contains. Above all, the adventurous spirits of other nations encroach more and more upon the undiscovered region, while England apathetically looks on, and allows her rulers to be guided by the ignorant and unpatriotic herd who mutter *cui bono?* There is no surer sign of a nation's decadence than when the spirit of adventure is overpowered by the indifference and inertness of routine. First the utility of those exploits which form the glory of a nation's history is questioned, gradually all efforts at emulation are abandoned, until at last even the desire to achieve great deeds is deadened. When that time comes for England her days of independence are numbered. But it is far distant. In no former time of our history has our navy contained so large a number of highly educated officers who thirst for the opportunity of distinguishing themselves: and two Arctic exploring ships could with ease be manned by volunteer crews of lieutenants. At no time, too, has there been so warm an interest felt in the question of Arctic discovery by the English public generally, which is shown by the almost unanimous advocacy of the press during the past year.

It is now an important duty, incumbent on the organs of public opinion, to make this feeling known to our rulers. If this is done now, if the country is but represented by the press, an Arctic expedition will be despatched next year; and England will be spared the shame and disgrace of seeing that great work, once peculiarly her own, achieved by others. The subject is now under the favourable consideration of the Prime Minister. The President of the Royal Society, who is not urging others to face dangers which he has not faced, but who has himself encountered the perils and risks of polar navigation, has fully represented the rich and fruitful results of Arctic exploration. The President of the Royal Geographical Society has again explained the geographical importance of such an undertaking, and has once more urged the national benefits to be derived from it. Admiral Sherard Osborn has entered upon all the practical details, and demonstrated the feasibility of Arctic discovery, and the absence of undue risk. The highest authorities on this subject have done their duty by thus placing the question, in all its bearings, before the Government. It remains for the feeling of the English people to receive adequate expression through the press, for our rulers to be made to feel that the appreciation of the uses of voyages of discovery is still as strong as ever; and the year 1875 will see the resumption of the glorious work.

There is much in the record of Arctic enterprise during the present year which gives additional force to the arguments in favour of an expedition. On the one side we see the fishery in Baffin's Bay increasing in value and importance, while the dangers of ice navigation furnish some important lessons. On the other we hear of the great achievements of a handful of brave men to the east of Spitzbergen, which, if anything can, must excite some feeling of shame at our own backwardness.

The Dundee whaling fleet has, during the season of 1874, been remarkably successful:—

'Victor'	170 tons of oil.	'Esquimaux'.	140 tons of oil.
'Camperdown'	190 ,,	'Narwhal'....	80 ,,
'Intrepid'	150 ,,	'Erik'	60 ,,
'Polynia'	130 ,,	'Active'	160 ,,
'Ravenscraig'	110 ,,	'Arctic'	185 ,,

One Peterhead whaler, the 'Mazanthien,' also went up Baffin's Bay this year, and has 40 tons. It must be remembered that this is an early report, and that by the end of the season all the ships will probably be full.

The report of the voyage of the 'Arctic,' unfortunately her last voyage, is full of interest. Captain Adams sailed from Dundee, on the 28th of April, with a full complement of fifty-four hands all told, and had a splendid passage to the south-west ice, where, however, no fish were taken by any of the ships during the present season. On the 24th of May the 'Arctic' called in at the Danish settlement of Lievely, in Disco, and reached the land ice of Melville Bay on the 30th of the same month. Here the whalers assembled, but they had not long to wait. This once formidable obstacle, which, in the days of sailing vessels, used to

cause a detention of weeks and even months, no longer forms a barrier to progress. The whole whaling fleet passed through Melville Bay in two days, and again demonstrated the wonderful improvement which steam has caused in ice navigation. After reaching the "North Water," Captain Adams met with great success, and by the 2nd of July there were twelve heavy fish on board, yielding 150 tons of oil and ten of whalebone. The 'Arctic' then went up Lancaster Sound, and entered Prince Regent's Inlet, where five more whales were taken. Captain Adams then put into Elwyn Inlet, where a large number of white whales were seen in the shoal water, and thirty-two were taken, yielding six tons of oil and two tons of valuable skins. On the 30th of July the 'Arctic' had gone up Regent's Inlet as far as the south point of Cresswell Bay, where she was stopped by ice; and on the 2nd of August she was off Cape Garry, with several other whalers in company. Afterwards, Captain Adams again steamed up the Gulf of Boothia as far as Brentford Bay and Cape Scoresby. The ice was then closing in upon the land, the weather being calm, and the 'Arctic,' 'Intrepid,' and 'Victor,' began to steam down the inlet. The 'Arctic' got as far as Fury Beach, when she was closely beset, in company with the 'Camperdown,' 'Victor,' 'Narwhal,' and 'Intrepid;' and on the 7th a strong gale began to blow from the S.S.E. The ice in which the 'Arctic' was beset drifted until it was brought up on Cape Garry, near the shoal water, which was sounded and laid down on the chart by Captain Markham in 1873. Then the seaward ice began to crush heavily upon the ship, and at 9 she was hove on her beam ends against the grounded pack. It was then discovered that she was making water rapidly, the port bow having been stove in. The water gained rapidly on the pumps, and soon the fires in the engine-room were put out. All hands were then set to work to save clothes and provisions. The ship was now held up merely by the pressure of the ice; and at 6 P.M. she took fire, probably from the galley forward. The flames rapidly spread, and, when they were at their height, the ice opened and the wreck went down stern first. Such has been the end of the good ship 'Arctic'; after a long and exceptionally successful career. She had made eight most remunerative voyages, and had repaid the cost of construction over and over again. In 1873 she made a memorable voyage; returning with the fullest cargo ever known, and with the officers and crew of the rescued 'Polaris.' It was then too that Captain Markham made his voyage for the purpose of acquiring a knowledge of ice navigation, the results of which were given to the world in his *Whaling Cruise to Baffin's Bay*. Thus the 'Arctic' had done right good service in her day. She was lost through one of those casualties which the best seamanship cannot always prevent, but which the use of steam has, in these days, rendered of very rare occurrence.

It should be remembered, that while in other seas such casualties usually involve a terrible loss of life as well as of property, in the Arctic Regions the very ice which causes the destruction of the ship ensures the safety of the crew. Captain Adams and his fifty-four men were exposed to much hardship, passing the night under a heavy storm of rain, until two tents were erected; and on the 8th they were divided among the four ships within reach. The other ships had experienced severe nips, and the crews got provisions and clothes upon the ice.

The 'Victor,' being full, eventually received Captain Adams and all his men on board, and returned to Dundee; where a new and larger 'Arctic' is on the stocks, which will proceed to Baffin's Bay in 1875, under the command of Captain Adams. The 'Polynia,' 'Erik,' and 'Ravenscraig' were still beset when the 'Victor' left Prince Regent's Inlet; but they were further from the shore than the 'Arctic,' and there seems to be little danger of any of them meeting the same fate. But even if all should be lost, the crews will find ample stores of provisions at Fury Beach and at Port Leopold, and the means of passing the winter.

Thus the experiences of the whaling fleet during the present year serve to impress the truth of several lessons in ice navigation. They once more furnish proofs that the old obstacle of the Melville Bay ice has ceased to exist, and that in most seasons steamers can reach the "North Water" with little detention. The loss of the 'Arctic' and the safety of her crew show the extent and nature of the risks to be encountered. With other vessels in company, or, in the case of a single discovery ship, with depôts of provisions judiciously placed, there is no undue danger, even under the most improbable contingency of the total loss of the vessel.

Turning from the incidents of this year's whale fishery to the results of the attempts at Arctic discovery, we hail the success of Lieutenants Weyprecht and Payer and their gallant followers with heartfelt satisfaction. It will be remembered that the Austro-Hungarian Arctic Expedition, under the command of Lieutenant Weyprecht, and consisting of the steamer 'Tegethoff,' left the Elbe in June 1872, and finally sailed from Tromsö Harbour, with that daring and experienced Arctic navigator Captain Carlsen as pilot, on July the 13th. On the 12th of August the 'Tegethoff' was off the coast of Novaya Zemlya, in company with the yacht 'Isbjorn,' commanded by Count Wilczek. The 'Isbjorn' parted company on the 21st August, and returned on the 23rd of August 1872, since which date the 'Tegethoff' had not been heard of, until the welcome news of the safe arrival of her crew at Vardoe in Norway reached us.

The 'Tegethoff' had last been seen off Cape Nassau, the point towards the northern end of Novaya Zemlya where the land trends to the east. On the very day that she parted company with Count Wilczek she was beset, and drifted in the pack-ice during the next fourteen months, or until October 1873; first, until February 1873, in a north-easterly direction to 73° E. longitude, and then north-west. At first calms prevailed, but heavy falls of snow, combined with great cold, rendered the surrounding ice impenetrable. Violent storms in September broke up the ice, without, however, liberating the 'Tegethoff' from its critical position in the midst of a vast floe, drifting about at the mercy of the winds. The pressure of the ice frequently threatened destruction to the vessel, which had been up-lifted to a height of 7 feet, and every attempt to liberate her, by blasting or sawing through the ice, proved abortive. On the 31st of August 1873, a hilly country was discovered, in sight of which the 'Tegethoff' was drifted about until the beginning of October, when the floe was driven upon the land, where it froze fast. In this position, in 79° 51′ N. and 59° E., the expedi-

tion wintered in 1873-74. Snow huts were built upon the ice, and a series of astronomical, meteorological, and magnetical observations was taken, the latter, however, being interfered with by the frequency of unusually intense auroræ borealis. When Lieutenants Payer and Weyprecht made their adventurous voyage in 1871, in the sea between Spitzbergen and Novaya Zemlya, they encountered unmistakeable evidence of the existence of land to the northward, between the meridians of 28° and 36° E.; when in latitude 77° 17′ N. The depth of the sea was decreasing, there were numerous bear tracks on the ice, and the fogs were thick and incessant. The same signs were encountered further east, in 78° 41′ N. This land has now been discovered. It is probably a prolongation of the Spitzbergen archipelago to the eastward, continuous with the high land discovered by the Dutch in 1707, and known as Gillis Land. Further north the sea increases in depth to a thousand fathoms, so that the new land probably consists of islands extending from Gillis Land to the east and north.

During March and April 1874, Lieutenant Payer conducted sledge expeditions along the newly discovered land to the north and west. One of them reached the parallel of 82° 51′ N., and land was seen extending as far as 83° N. The newly-discovered land is dreary in the extreme. Many bears were killed, but no other quadrupeds were met with, and the flora is exceedingly poor. A large portion of the land is covered by immense glaciers. The conical peaks rising above the plateau attain a height of 5000 feet. The prevailing rock is dolomite. The newly-discovered land has been ascertained to extend through 15 degrees of longitude, but is probably of much greater extent, as its termination could not be seen from the summits of the mountains. It has received the name of Franz Joseph Land.

On the 20th of May they set out on their return journey with three boat-sledges. Their progress was exceedingly slow. On the 3rd of June they were still within 7 miles of the abandoned vessel, and finding their progress barred by floating ice they returned for a fourth boat. A second start was made on the 17th of June, but owing to southerly winds no progress could be made, and the 15th of July still found them within 7 miles of the 'Tegethoff.' Northerly winds set in at length, and open water was finally met with on the 15th of August in 78° 40′ N., 61° E. The sledges were then abandoned for the boats. Cape Nassau, on Novaya Zemlya, was sighted three days afterwards, and sailing along the coast of that island in a southerly direction, our adventurous travellers fell in with a Russian schooner, in Pukhova Bay, on the 24th, and they reached Vardoe, in Norway, on the 3rd of September. At Hammerfest the Austrian navigators met the English schooner 'Diana,' which was about to search for them. Count Wilczek has generously undertaken to pay the wages and other expenses which have accrued in consequence of the prolonged absence of the expedition, amounting to about 2000*l*. The health of the explorers continued excellent during the whole time, only one man having died, an engineer named Krisch, who succumbed to a pulmonary complaint, in March 1874, the seeds of which had been sown long before he joined the expedition.

The complete success of the Austrian Arctic Expedition is most encouraging. It furnishes one more proof of the healthiness of the Arctic climate, of the absence of undue risk even when the ship has to be abandoned, and of the important results to be secured by any expedition, when led by an experienced and resolute commander. It is also extremely gratifying to find that Lieutenant Payer, by studying the instructions furnished to him by Sir Leopold McClintock, has achieved great success in sledge travelling. Following the impulse of a generous nature, the very first thing that Payer did, after landing in Norway, was to send the following telegram to McClintock:—"In following your advice, endless advantage. Pray accept thanks. Discovery of land 200 miles north of Novaya Zemlya. Information follows."

The reception of the members of the expedition throughout Norway was most enthusiastic. The King invited them by telegram to visit Stockholm on their journey home, but circumstances apparently did not admit of this, for we hear of Payer's and Weyprecht's arrival at Hamburg, where they are being entertained as the guests of the Geographical Society.

Lieutenants Payer and Weyprecht will deservedly receive a hearty welcome from their own sovereign and countrymen, and the cordial congratulations of all geographers. They have, by dint of perseverance, intrepidity, and the most careful study, made a great and memorable discovery, of which the Austro-Hungarian nation may well be proud. If, as we confidently anticipate, their success excites some feeling of shame in this country, at the disgrace which is being brought upon it by the inertness of our Government, they will also have conferred a benefit upon Old England, which those who love her will long remember with gratitude.

TRAVELS IN NORTHERN PERSIA.*

THE writer of these notes last year accompanied Colonel Valentine Baker in a hurried tour through Northern Persia, with the idea of roughly sketching some of the ground, and of making as good a map as circumstances would permit of the country visited.

The map has no pretensions to extreme accuracy. No other means for measuring distances were available than a judgment of the pace of a horse; and often on dark nights direction was judged only from the stars. Observations were taken when time permitted, but I regret that, owing to the roughness of the country, watches and chronometers were alike untrustworthy, and the only result of the observations was the proof of this. The only observations that can be considered to have given useful results, were those for latitude by meridian altitudes. The heights of mountains, &c., were all taken by two, and sometimes three, aneroid barometers, corrected when possible by Casella's hypsometer, a most useful and convenient apparatus for travellers. The roughness of the work can be estimated from the fact that three barometers, always carried on my own person, were so much shaken as to differ by as much as an inch. The corrections that I was able to make with the hypsometer were, however, quite sufficient to give me confidence that the heights I have laid down are fairly accurate.

With regard to the nomenclature, I should wish to make a few remarks before passing on to the principal part of this paper. It is extremely difficult to arrive at the correct nomenclature, as the ordinary Persian is very careless in his pronunciation of names. I have often had a name repeated to me six or seven times, each time with a different sound. Again, Europeans have such different systems of representing the same Oriental sound, and many do not even agree in endeavouring to represent the sound, but try to translate the name by translating the letters. It is greatly to be wished that English travellers, at all events, could be induced to adopt some recognized system of orthography. The name of the Holy City of Meshhed is a notable example of the variety of systems. I have seen it spelt Mashad, Mashed, Meshed, Mushed, and Mashhad. I have endeavoured myself to write the names in such a way that an English person reading them would, as nearly as possible, approximate to the sound.

Another difficulty a traveller in Persia has to encounter in making geographical researches is that in any district all geographical features bear the name of the district, so that a river passing through half a dozen districts will have half a dozen different names.

Again, the inveterate habit of lying throws great obstacles in the way of obtaining geographical knowledge. The traveller may often spend an hour in conversation, and flatter himself that he has obtained a great mass of useful information, only to find next day that the whole of it is a tissue of falsehoods, fabricated in all probability to affect in some way the movements of the traveller, to benefit the mendacious speaker, or save him some trouble.

The northern parts of Persia are covered with great masses of mountains, and on those portions immediately on the borders of the Caspian Sea, these mountains are only separated from one another by narrow valleys, sometimes mere gorges; but as we get eastward there is a considerable change, as the mountains there run in long parallel ridges, with wonderful regularity, in a north-west and south-east direction, and are often separated by wide valleys, generally very flat and level.

The city of Teherān is situated on the edge of a vast plateau, about 4000 feet above the level of the sea. About 10 miles to the north of the city is the great range of mountains known as El Burz, one of whose peaks, immediately above Teherān, is 12,000 feet high. These mountains are remarkably bold, with very steep sides, the roads through them winding up the steepest zigzag, and it is no uncommon thing to stand on an elevation of some 8000 feet, with the plain apparently directly underneath, and, in reality, often not more than 5 or 6 miles in a horizontal line. These passes can, of course, only be used in the summer; in the winter they are left to themselves, in all the gloomy desolation of fog, ice, and snow; and even in the month of August most of the mountain roads are impassable for anything but the most sure-footed ponies or mules.

Immediately at the foot of these magnificent mountains is a cluster of villages, which, from their superior climate, have been adopted by the European missions as summer residences, when the close and intense heat of Teherān is almost unbearable. These villages are from 800 to 1000 feet higher than the city, and although the heat during the day is very great, the evenings are comparatively cool.

An excellent carriage road has been made from Teherān to Gulhek; this village is the absolute property of the British Government, and the natives who live there are free from all taxation by the Persians. The sides of the roads are planted with trees and flowers, and in the evenings a good many carriages, belonging to Europeans and Persians, may be seen here.

From Gulhek into the mountains, the road almost immediately ascends a steep spur, the crest of which is 10,000 feet high. Here, on the 13th of July, we found snow in the crevices of the rocks and on the edge of the streams. The mountains generally are very bare, but here and there there is a little scanty vegetation. I noticed a wild rhododendron at an altitude of 10,000 feet. From the crest of this spur the road still ascends a steep path, and passes over a point 12,200 feet high. There is a peak near which rises 400 feet higher, and this is the most elevated point in this grand mountain.

The tops of these mountains are covered with loose stones. In the winter the cold is of course intense at these immense altitudes, the water in the numerous crevices freezes, and the expansion bursts the rock into innumerable fragments. In these solitudes where down below lies the vast and arid plain, stretching towards the horizon, invisible in the dim haze of the desert, is the home of the ibex and mouflon; and often when no other sound is to be heard but the scream of an eagle astonished at the unwonted sight of a human being, the metallic ring of the loose stones rolling down the mountain side attracts the sportsman's notice to a herd of these animals, dashing up what would appear an almost impossible precipice.

A little below the crest, at an altitude of 11,819 feet, we pitched our first camp. From here the road

* Read at the Geographical Section of the British Association at Belfast, August 1874.

at once descends by a steep zigzag into a valley, in which, during the summer, large herds of sheep and goats are fed on the somewhat scanty vegetation. Lower down, at an elevation of 8770 feet, is a small tank around which during the summer a few nomads pitch their miserable black tents; and from here a stream, in which, a little lower down, are some excellent trout, runs into a narrow and fertile valley.

The character of all the valleys in these districts is the same—beautiful springs of clear and cold water bursting from the rocks. Rich barley fields, watered by innumerable miniature canals; at every 2 or 3 miles a small village, the flat-roofed houses of which are hidden in ash, poplar, and walnut trees; and rising abruptly from these valleys are the bare and rugged mountains on which there is scarcely a blade of grass.

A little below the village of Shehristanik the stream breaks through a gorge, and, passing within 20 miles of Teherān, is lost in the desert. This term, "lost in the desert," is however scarcely correct, because every drop of water being used for irrigation, it can hardly be said to be lost. The Persians are very clever at their irrigation works; the water is often conducted long distances, and is turned first on to one field, then on to another, as it is required.

From a point not far from this an excellent road into the Mazanderān has been made—one which is in every way a remarkable contrast to the wretched mule-tracks which generally are the only apology for a road.

The character of the Persians is exemplified in their engineering works in a most striking manner. The governors of provinces are very fond of making a good carriage road when possible, and it is by no means an uncommon event to suddenly arrive on one of a most ambitious description. This will be continued as long as no difficulty presents itself, but directly the smallest engineering skill is required, the unconquerable idleness and want of energy of the people become apparent: the work is abandoned, and the mule-track, where often the bât animals have to be unloaded, is left until the difficulty is passed, and then, when in fact the road is comparatively little wanted, the works are again commenced. Their system of irrigation is of course to them an absolute necessity; without it they would starve. Were good roads equally a matter of life and death, no doubt the difficulties would be overcome.

At Shimshak is a coal-mine, whence coal is taken into Teherān. Within 2 miles of this village is an unworked seam of surface coal; the direction of the strike is E.S.E. The cost of transport is, however, so great, that although it may be had for the trouble of digging it, it costs at Teherān somewhere between 2*l.* and 3*l.* a ton.

A little further to the east is the river Jarjerud, the valley of which is at this point from 1 to 1½ mile in breadth, and is extremely fertile. Following up one of the branches of the Jarjerud, the watershed between the Caspian and the Teherān plain is reached at a point about 10,000 feet above the level of the sea. Immediately after this crest is passed, a torrent descends between cliffs, and the valley of the Lar is reached. This valley is of a totally different character to those on the other side of the watershed. The plain is about 1½ mile in width, through which at this season of the year (July) the river flows at a gentle pace, but where in the early spring the water must pour down with tremendous violence, a roaring flood, which from the appearance of the banks must be a quarter of a mile broad. The valley here is dreary in the extreme, not a tree or shrub will grow, and no corn. There is, however, a good deal of a kind of rough grass, on which large flocks of sheep and goats are fed, the owners living in black tents. About the month of September they migrate to the villages and towns in the Mazanderān. The whole of this valley is during the winter buried in snow and ice.

One of the sources of the river Lar is most remarkable. An enormous mass of clear and icy cold water bursts from a crevice in the rock. This mass of water is in itself sufficient to make a stream of some size. This river is full of the most delicious trout, which run up to three pounds in weight, and the English at Teherān almost always spend a portion of the summer fly-fishing. The natives also succeed in capturing a large number of fish near the sources, where the river is only a narrow and shallow stream, but they do so by damming up the deeper channels and forcing the fish, who are working their way up stream, to try a passage in the shallow channels, and the natives stand in the water, and strike the fish with sticks as they dart past.

The first stream that runs into the Lar is called the Ab-i Safid, from its whiteness, which is evidence of a large mass of chalk somewhere amongst the mountains.

The next tributary is called the Demavend River, and on the north of the Lar at this part the whole ground is covered with spurs from the magnificent mountain of Demavend, whose summit is estimated at from 18,000 to 20,000 feet.*

Beyond this there is a little cultivation, and a few wild pomegranates appear. A little below there is a good bridge, with a road leading to the south to the villages of Demavend and Bumehan. Here also is a little open ground, and the slopes of the valleys are well cultivated. A little below this the river again enters a narrow gorge between perpendicular precipices 200 to 300 feet high; the path is obliged to pass above the precipices.

At Ask, a very large village, are numerous sulphur springs; there is also a great deal of iron in the water. Near this the valley is very fertile with trees and corn-fields, and is thickly populated. There are high table-lands on each side, some of them 2 or 3 miles square, perfectly flat, elevated above the river about 1000 feet, and separated from it by steep precipices. These table-lands have evidently been at one time a valley similar to that of the Upper Lar, through which the river must have flown at a gentle pace.

A little way up one of these tributaries, the Ab-i Garma is reached, a hot spring that bursts from the hill side in a beautiful clear stream, the temperature of which is about 160° Fahrenheit. This warm spring is slightly effervescent; it contains apparently a good deal of sulphur, and has a very unpleasant odour. The water runs down about 100 yards into a dirty pool of black mud in which the natives delight. They come from immense distances to bathe here, and sit for hours in the black mud, smearing themselves all over with it. They will do this even if they are in perfect health. There is also here an artificial bath,

* According to Ivashchintsef's trigonometrical measurement, 18,454 feet.

and on one of the plateaus before referred to are extensive remains of the old Roman baths. Below this the river Lar becomes a rapid and turbid torrent, and at the point where the river bends from the east to the north, there is a great deal of cultivation, with fine trees and vineyards; but immediately below this all cultivation again disappears, and with the exception of a few stunted willows, close to the water's edge, there is scarcely a leaf.

Enormous fragments, torn from the mountains by the winter's frosts, strew the ground in all directions, and the scenery has a savage grandeur peculiarly its own. Soon after the mountains again close in, and a little lower down precipices 300 to 400 feet high run sheer down to the edge of the water; and the road, which is cut out of the rock in such a manner that in two or three places a rider has to stoop and mules have to be unladen, almost hangs over the stream.

The village of Kharu is a little oasis in the middle of this gloomy scene. There is a small open space, and the houses at this time of year (18th August) are hidden in mulberry and walnut trees in their richest foliage, but immediately below the valley again narrows. Here in the sides of the rocks on both sides holes have been excavated as temporary resting-places for travellers, as it is impossible to traverse these roads on a dark night.

The scenery does not vary until near the village of Shahzade, when trees begin to appear—first a few beech trees in the valley, then on the hills a great number of small *lignum vitæ*. Soon after, a hill, well clothed with foliage, appears. At Shahzade itself the hills are well covered with trees, the valley widens, and at about 7 miles lower down the forest commences, every hill side being clothed to its summit with trees. The valley continues to open out, the hills on each side become lower, and the river here runs through a park-like country where the grass is of the richest green and trees in full foliage.

The forest extends to within about 5 miles of Amol, where the plain is covered with a jungle of high grass, common bracken, blackberry bushes, and wild pomegranates. There is barley cultivation in patches, but not so much as might be expected from the richness of the soil; the villages are surrounded with magnificent trees, and every here and there are clumps of the most splendid beeches, oaks, and walnuts.

Amol at this season of the year is quite empty; and the deserted bazaars, with all the shops shut up, and locked with the primitive padlocks in use here, presented a curious scene. The inhabitants all go to the hills during the summer to feed their flocks, and do not return until the snow drives them down.

The river at Amol is very small even now after a good deal of rain, because nearly the whole of it has been diverted into irrigation channels, and used for the purpose of cultivation. There are reputed to be salmon in this river, and we came down here on purpose to see them; but I do not believe in their existence. They catch large fish of some sort in the winter and dry them; I don't exactly know what the fish are, but certainly not of the salmon tribe.

From Amol to Barfrush the country is the same in appearance, and for the first 3 miles all marsh, after which, although cut up by many streams, it is comparatively dry.

About a mile beyond Barfrush, the road to Mehdunisir enters a beautiful forest of beeches, walnuts, and oaks, with undergrowth of pomegranates, vines, brambles, and bracken fern, so dense that not even a dog can penetrate it. The road itself is a mere path, through which laden mules can scarcely pass.

Mehdunisir is on a stream; the village is on a small open space, with a little cultivation, surrounded by the same impenetrable forest which extends another 2 miles to the north, after which the country opens out, and there is a good deal of cultivation. Here we struck the Chapard road from Sari to Teherān. From Haftan to Shergao the whole country is covered with the most magnificent forests of planes, beeches, oaks, and walnuts, and between Shergao and Zirāb are immense box trees, sometimes as thick as a man's waist, and shooting up as straight as the mast of a ship, but they appear in large numbers in this particular spot only.

The forest above Zirāb is very different: it is composed of the same magnificent trees with the addition of teak trees; but there is absolutely no undergrowth. The road is good, though very heavy after rain, and ascends gradually to a height of 4300 feet. Here a descent commences, and immediately after crossing the ridge the forest completely changes in appearance. The trees are in patches only on the hills, between which are open slopes of green grass. A valley, enclosed by small hills, opens out, which is very fertile, and, where not covered with rich barley fields, there is excellent turf, which affords grazing ground for large flocks of sheep and cattle. The valley is thickly populated, and there are villages at almost every mile in any direction.

Beyond Ali Abad the forest becomes more dense for a few miles, and the road is very bad after rain, being through a very heavy, sticky clay. A little beyond this the forest begins to disappear; the sides of the hills have trees only in patches, between which are green slopes, and sometimes bare rock; and in the valleys where water can be obtained every available foot is used for rice cultivation.

Beyond Atula are scarcely any trees but a few stunted oaks; and, after crossing another summit, there is nothing but the bare rock. There is a long, undulating plateau, nearly 7000 feet high, about 7 or 8 miles across, in which is the line dividing the water basin of the Caspian from the streams that flow into the desert.

There is a spring of good water about 3 miles from Sakardeh, but there is besides this no good water till Cheshmeh Ali is reached. A little before this there is a marsh about 2 miles long, with long reeds, in which we found a few duck and other aquatic birds.

Cheshmeh Ali is a very fine village where there is a fort, and from here a beautiful stream of clear water joins the hitherto almost stagnant rivulet. Here also the Shah has a palace very prettily situated, with a large pond of clear water.

Below Bawabad the river leaves the mountains and enters the desert, which stretches from here 400 miles to the south. It runs as far as the village of Tark, where the last drop is used for irrigation.

Across the desert detached mountains can be seen about 50 or 60 miles distant, apparently 5000 or 6000 feet above the plain. The road from here to Shahrud is excellent, along a level, sandy plain, dotted with towers, which have been built as a protection against the Turkomen, and all the villages are surrounded with walls for the same reason.

From Shahrud to Bedesht, over a level, sandy plain, and on to Ameyun, which lies amongst some low hills, and until Meiomid is reached, there is no cultivation. There are mountains on the right, and on the left can still be seen the continuation of the range which encloses the Bostam plain on the north.

Meiomid is a large and important place with many gardens, good fruit and vegetables, and a fine caravanserai. This village is situated at the foot of a pointed and precipitous rock, of which Ferrier observes, that "the inhabitants have never ascended, believing it to be the abode of evil genii." The inhabitants are less superstitious in the present day, but probably make as few excursions to the top as they did before.

The road to Miāni Desht passes over the same dead waste. In one point there are a few low sandhills which is considered a dangerous spot on account of the cover any stray Turkomen could find.

At Miāni Desht is no village, only an old caravanserai, built by Shah Abbas, falling into ruins, and a very magnificent new one, to contain about 1,000 travellers. This is loopholed and flanked with towers, and it will be, when finished, a really strong fortress. The water here is filthy. With reference to the old caravanserai, said to have been built by Shah Abbas, it is worthy of remark that the Persians ascribe all public works to Shah Abbas, and if he constructed only half of those he is credited with, he would have deserved well of any country, much more of a country like Persia, whose rulers generally think of nothing but their own pockets.

From Miāni Desht the road passes through another range of sandhills, and then emerges on to the plain which from here to Abbas Abad is much cut up by water courses.

Abbas Abad is a small village with a fort, and a good caravanserai, and contains about 100 inhabitants. The water is very good and plentiful. This is one of the villages in which Shah Abbas the Great settled the Georgians. Ferrier says of them that in his time they still retained the Georgian type; intermarriage with Persians has since then completely eradicated this.

At about 8 miles from Abbas Abad on the road to Mezinan is Pulabrashim, over a now dry watercourse. It is said that the Turkomen never cross the bridge, and once over it the travellers and pilgrims consider themselves safe. About 4 miles beyond Pulabrashim is a fort and caravanserai. The road to Mezinan passes through extensive ruins, evidences of former grandeur and the wealth of the place. At Mezinan is an old caravanserai, built by a son of Haroun Al Rashid, and destroyed by Tamerlane, on which are Cufic inscriptions.

From Mezinan to Mihr, across an arid plain, without cultivation, except a little round the village of Sutkar. Mihr is a village of considerable size, with five plane-trees in one of the streets; the water is good and plentiful, but as the stream runs over a porous bed, the inhabitants have a singular custom of throwing a quantity of mud into it about 7 miles up; this they say prevents the bed absorbing as much as it otherwise would. Whatever may be the value of this practice, it is exceedingly annoying to the thirsty traveller. In the mountains to the north of Mihr there are extensive copper mines.

Before reaching Sabzevar an old Arab minaret with Cufic inscription stands by itself, the last link between the present and the past.

Sabzevar stands amongst a great deal of cultivation, and is surrounded by a wall with towers and a ditch, and on the north side of it a citadel.

Maden is composed of two thriving villages, Kala-i-poi, Kala-i-bala, which mean the upper village and the lower village, with good gardens, and fair water, which is very plentiful; but the women always wash their clothes at the head of the stream, which is a somewhat unpleasant practice. About a mile from here are the celebrated turquoise mines.

Derud, a beautiful village, with gardens and fine trees, and a tumbling stream of clear water flowing over a rocky bed. The road follows the valley for some distance, and the trees extend for about 3 or 4 miles above Derud. The difference of climate on the two sides of the mountains is very remarkable—at Derud the day was hot and sultry, while on the north side of the mountain, at almost the same elevation as Derud, the sun even in the middle of the day was very welcome. The mountain on the north side is very bare until about 2000 feet from the summit, where small trees begin to appear in the valley on the edge of the stream. It was here that we had been promised trees so high that if we should attempt to look at the tops our hats would fall off. Numbers of little fortresses are perched on the hills; they are all of mud, but their positions are well chosen.

From the summit of this mountain which is reached by what is, for Persia, a very fair road, the road descends to the great and Holy City of Meshhed, the shrine of Imam Reza; next to Mecca, the most sacred spot for a Shiah Mussulman. On a bush from which the first sight of the city is obtained, hang numerous little bits of rag, which the devout always place here when they first see the goal of their ambition. Beyond its holiness, Meshhed has few attractions or peculiarities; it is with its gardens about 12 miles in circumference, situated in a perfectly flat plain, well cultivated, with plenty of water.

Between Kardeh and Wardeh the road follows a stream amongst some high mountains, which end in tremendous cliffs. The valley is in many places only a few yards wide. The only vegetation is the wild barberry, which grows in great quantities, and a few wild briars.

At Kardeh I saw the inhabitants making a syrup from grapes. They boil the grapes in great vats with a fire underneath. The building altogether is very like a kiln, and the fire is lighted from the outside. The grapes are simply boiled in these cauldrons, and a kind of syrup is made which is too sweet for the taste of most Englishmen.

Kilāt is one of the most remarkable places in the world: it is a natural fortress, and if anything in the world can be impregnable it is certainly Kilāt. The description of the happy valley in the romance of Rasselas might almost be taken for it. It is a large valley, surrounded on all sides by mountains absolutely inaccessible from the outside. At the tops of these mountains can be seen perpendicular cliffs some 200 or 300 feet high.

There are five entrances to the valley through narrow gorges only 2 or 3 yards wide, the cliffs on each side towering up like walls. The valley, besides a stream that runs through it, is plentifully

supplied with water from springs, and there must be many minor streams that run down from the mountains. There are several villages in this valley. The inhabitants have their herds, and cultivate their corn all in the valley, and consequently they could not be starved out, as they always live on what is grown inside, and there is plenty of pasture for their flocks. This valley appears, however, not to be very healthy: it is probably too much confined.

From Kilât to Idalik the road winds amongst hills with mountains on the left from 7000 to 10,000 feet high. There is scarcely a level mile on this road, and from the summits of the hills the plain of the Attock can be seen stretching to the north.

Before reaching Chepishli, we crossed a fine stream called the Rudvar, running through a wide valley with plenty of grass, and here the Turkomen come to feed their horses. It is considered a dangerous place on that account, and there is not a village nor any cultivation. The greater part of our escort deserted us before we reached this valley, and we marched across it with only about half a dozen soldiers. When next we paid a visit to it, in company with the Governor of Deregez, our escort was 700.

The Deregez district, which from its position, jutting out into the Turkoman country, should be the least prosperous in Persia, is by wise government the only country through which we passed in our whole journey where prosperity is evident. The moment we entered the Deregez district the country seemed to bear on its face the evidences of comfort. The peasants looked happy, instead of bearing on their countenances that look of oppression which is almost invariably to be seen. The villages and bazaars were scrupulously clean, presenting a marked contrast to those in other districts. Elia Khan is the name of the governor, and he and his fathers have ruled this district for 200 years.

The relations maintained between the Persians and Turkomen on the frontier are very extraordinary. Elia Khan appears to be on most friendly terms with the Turkomen, yet he knows that if he relaxed his watchfulness for one day they would attack his country. Some years ago, owing to an intrigue, he was deposed from his governorship, and some one of the ordinary Persian stamp, a miserable creature, whose sole idea was filling his own pockets, was appointed governor. He very soon became a prey to the Turkomen; the province was overrun, and whole villages destroyed. Persians were taken by hundreds and sold into slavery; and so critical did the position of affairs become that the Shah was obliged to reinstate Elia Khan, because he found that he was the only man who could by any possibility remit money to him; this of course being the one and only object in appointing governors; and nothing could be said more creditable to any man than that, in the midst of this mass of corruption, one should be found who had a soul above the miserable meannesses, the tyrannical oppression, and greed of gain, by means, however abominable, which are the distinguishing features of Persian administrators.

Immediately on the re-accession of Elia Khan, the Turkoman forays ceased, and Deregez is, as I have shown, the most thriving of the Persian provinces. Yet this is not attained without constant watchfulness; sentries are always on the alert, and Elia Khan is always ready for an attack: but, notwithstanding this, the Turkomen and Persians are upon most friendly terms, and traders pass between the two countries, and Elia Khan could at any moment get 1000 Turkomen to fight for him.

When we were in Muhamedabad, Elia Khan had a quarrel with the Amîr of Khorasan, who is his chief. Elia Khan prevailed upon the Governor of Kuchan to assist him, but the Governor of Bujnurd, another neighbour, refused. The Amîr marched to Kilât from Meshhed, and then they made peace; Elia Khan, in all probability, paying a very handsome peace-offering. The Amîr was also undoubtedly influenced by the fear of the assistance Elia Khan would have received from the Turkomen; indeed he informed us that had the Amîr marched beyond Kilât, he would have sent 1000 Turkomen against him. After this, however, a regular feud was established between the Governors of Deregez and Kuchan on one side, and the Governor of Bujnurd on the other; and when we were in Bujnurd it was evident that there might be a fight at any moment. This animosity was so intense that it penetrated to every class of society, and no man in Bujnurd would have any communication with those of Kuchan or Deregez.

We left Shirwan, a Kuchan town, with a fair escort, and in ignorance of this feud marched to Sisou, on the Atrek, the first of the Bujnurd villages; but when we arrived we were not admitted, and although we had the order of the Prince President of Persia (who acted as the representative of the Shah during his European tour), recommending us to the care of all whom we might meet, we could gain no civility of any kind from the Bujnurd people, nor could we hope to get supplies. We soon, however, discovered the reason, and dismissed our escort. When they were well out of sight, we met with the usual courtesies from the headman of the village, who had previously declared that he respected neither God nor man, nor the Shah, but that the Governor of Bujnurd was his father, his mother, his all in all.

From Muhamedabad to Durunga, the road follows the river, which flows through a most fertile valley, with numerous villages, surrounded by very large gardens, and a good deal of cultivation.

In Nohandân is an old fort, of a construction which must have been common at one time in these parts of Persia. An artificial mound of earth, 20 feet high, and 100 yards in diameter, was raised, and on this a fort was built. Remains of these constructions we saw near Shahrud, and in several other places on the road. Nohandân is surrounded by particularly fine gardens. Here and at Kuchan there are immense vineyards.

The Kuchan valley is very fertile, well watered, and extensively cultivated. From Kuchan to Shirwan are numerous villages. Shirwan is enclosed in walls and towers, and beyond this the cultivation diminishes.

Beyond Reizabad the road leaves the Atrek, and follows its affluent the Babaman through a narrow gorge to Aman, where the valley opens out into an extensive plain, in which is situated the town of Bujnurd, surrounded by walls and towers. Between Bujnurd and the Atrek is a ridge of hills, almost mountains. The Atrek north of Bujnurd runs through a valley about 10 miles wide. On the north it is bounded by a range of hills; these run into the main chain of mountains bordering the Atrek, and in some places these latter must be 10,000 feet high.

Immediately above Kizil Arvat there is a magnificent mountain, which is seen for nearly 50 miles. Below this point the river Atrek maintains the same character of a sluggish stream, running through a plain, which in places is more than 10 miles wide, and in others the mountains close in and the valley narrows to a mere gorge.

At Pishkala the river is about 35 feet wide, 2 feet 6 inches deep, and runs at about 3 miles an hour. Pishkala is the last valley on this part of the Atrek. Below this it is entirely given up to the Turkomen.

We here left the river and crossed a range of hills into the Simalghan Valley, the water from which passes through a narrow gorge into the Atrek. A very high range of mountains separates the Simalghan Valley from the Shuhan Plain. The mountains are covered on their northern slopes with forest—the only forest we have seen except in the Mazanderān.

Shuhan is situated in another plain between high mountains, and through a gap in the southern of these two chains a little stream runs which leads into the plain of Esfaroyin, an immense plain, which extends to Sabzevar and Meshhed, and on which there are many villages. In this plain is Sanghos, a considerable town, with walls and towers, and which would make the most magnificent head-quarters for a sportsman. Here, on the plain, partridges and bustard may be found. Wild boar abound in immense numbers, and the extensive plain offers a ground for pig-sticking which can hardly be rivalled. There are immense herds of wild asses, which might be ridden down on well-trained horses. In the mountains are ibex and mouflon, and on the lower slopes are small deer.

This plain is of vast extent and little cultivated to the west. It extends to Shahrud and then on to the Great Salt Desert; and to the east of Meshhed, a sluggish stream runs through it which ultimately reaches Meiomid. The whole surface of the ground is encrusted with a saline deposit, in many places half an inch deep. There is little or no water on the northern side of this plain except this very brackish stream, nor are there any villages between Sanghos and Jah Jerm. Jah Jerm is a large and important walled town with towers, and a fort with a wide ditch: it is a garrison town, armed with one gun, for which there is, in all probability, no ammunition.

Beyond Jah Jerm we struck the usual main road between Meshhed and Teherān. It is too well known to Europeans, and has been described so accurately by Ferrier, who is one of the most trustworthy authors whose works I have ever read, that I shall close my remarks.

The rapidity of the journey must be an apology for the scantiness of the notes, but if the map or notes (however deficient they may be in themselves) are of any assistance to the future traveller, or in any way assist him in his researches, I shall feel that my work has not altogether been thrown away, nor the time that I spent on the journey altogether wasted.*

W. J. GILL, *Lieut. R.E.*

* We have taken Lieutenant Gill's route from his own manuscript map. The country adjoining it has been delineated from other authorities, including Markozof's map of the Lower Atrek, and of the Yomud country, Lemm's astronomical positions, the map accompanying Khanikoff's expedition, &c. We have, as a rule, adhered to Lieutenant Gill's spelling; the vowels, however, are to be pronounced as in Italian. Lieutenant Gill's altitudes have been inserted upon the map. They agree fairly with the results obtained by his predecessors.

DR. G. NACHTIGALL'S EXPLORATIONS IN AFRICA, 1869—1874.*

I HAVE undertaken to place before the Geographical Section of the British Association a concise account of the travels of Dr. G. Nachtigall, whose name is as yet hardly known, except to professional geographers, but whose achievements entitle him to a foremost position amongst that numerous band of explorers who, within a comparatively small number of years, have done so much towards an elucidation of African geography. The principal scenes of Nachtigall's explorations are, the desert tract lying to the east of the main caravan route from Murzuk to Kuka; the country to the north and north-east of lake Tsad, and the region between Bornu and Upper Egypt. Many of the countries described by him have not previously been visited by European travellers, and our knowledge concerning them was based upon native information and itineraries. Nachtigall's journey through Wadai and Darfur to Egypt especially is deserving of commendation, as it has been repeatedly attempted, but in no instance with success. Barth proposed to visit Wadai, but instructions forwarded to him from England induced him to turn his steps westward to Timbuktu. Vogel, in 1856, penetrated to Wadai, but was executed by order of the Sultan of that country. Beurmann, in 1863, fell under the hands of assassins on the threshold of Wadai; and Rohlfs, in 1866, vainly sought an opportunity of visiting that kingdom. Darfur, on the other hand, was visited by Browne in 1793, and by Cuny in 1858, the latter dying there. The German Expedition, which was organised in 1861 to recover Vogel's papers, and continue the work begun by him, wasted its energies in the countries east of the Nile, and only one of its members—Mr. W. Munzinger—attempted to carry out the instructions issued to it. After a stay of three months at el-Obeid, the capital of Kordofan, he returned baffled, having failed to obtain permission to proceed to Darfur.

The immediate cause of Nachtigall's journey is to be traced to the desire of the German Emperor to mark his appreciation of the kindness with which the Sheikh Omar of Bornu had treated various German travellers, who had visited his dominions. Dr. Nachtigall, at that time body-physician of the Bey of Tunis, volunteered to accompany the presents, which it was proposed to forward to the Sheikh. From his long residence in Northern Africa, and intimate knowledge of the language and the customs of the country, he was peculiarly qualified for this duty. Nevertheless, in one of his numerous letters home, he expresses himself conscious of the inadequacy of his scientific attainments, and pleads his enthusiasm as an excuse for entering upon the enterprise before him. In this Nachtigall certainly underrates his qualifications. His barometrical, aneroid, and boiling-point observations, enable us to gain a fair idea of the hypsometrical features of the countries explored by him, and his inability to determine the position of places astronomically is compensated for by careful route surveys, ethnographical and historical researches, and the industrious collection of itineraries, and of other information from native sources.

* Read at the Geographical Section of the British Association at Belfast, August 1874.

Nachtigall left Tripoli on the 18th of February 1869, and travelling by the well-known road *viâ* Sokna he reached Murzuk on the 27th of March. There he was delayed beyond expectation. The Welad Sliman and their Tibbu allies, had directed their raids against Bilma, on the caravan route leading to Kuka, and travelling under these circumstances was deemed unsafe.

Seeing no prospect of being able to leave Murzuk at an early date, and anxious to allow no opportunity to escape him of adding to our geographical knowledge of Central Africa, he resolved upon a visit to the Tibbu Reshade—the inhabitants of Tu or Tibesti. He arrived at this resolution in spite of the unfavourable reputation which these inhabitants of the Sahara enjoyed, and which his own experience did much to confirm. With four camels and four servants, he left Murzuk on the 6th of June 1869. His route first led along the beaten track to the south, but at the well of Tymmo, five days beyond Tejerri, he struck to the south-east, and after a most fatiguing march through the desert, during which he suffered much from the want of water, reached the hilly district of Afafi. In the geological structure of these hills limestone and dark-coloured sandstone predominate, and large blocks of basalt are scattered over the country. They are intersected by numerous torrent-beds, abounding in bright-coloured Talha trees, to which the grotesquely-shaped dark hills formed a pleasant contrast. Nachtigall resumed his journey on the 5th of July. His road led him over barren, gravelly or stony plains of a yellow hue, above which rose numerous isolated groups of serrated and castellated dark sandstone hills. The torrent-beds alone afforded scanty forage for camels, but no inhabitants were met with.

A striking change in the nature of the country was observed on reaching the torrent-bed called Enneri Tollobu, on the 12th of July. A light, porous rock, varying in colour, took the place of the gravel or limestone rock, forming an undulating surface, altogether barren of vegetation.

On the 13th our traveller reached Tao, the first inhabited place of Tibesti, at an elevation of about 2100 feet above the sea. Tao is not, strictly speaking, a village, for it consists merely of a few scattered huts made of Dum-leaf matting, erected in the vicinity of some bountiful springs. At the time of Nachtigall's visit, Tao, as well as the other places on the western slope of the Tarso chain which intersects Tibesti from north to south, was found to have been almost deserted, for scarcity of food had induced the inhabitants to retire to the hills, or to make their way to Bardai, the most considerable place of the country, on the eastern slope of the Tarso, where the date harvest was soon expected to begin. The Tibbu, indeed, is by no means too lavishly provided with food. There are herds of goats, but meat is eaten only on high holidays, or when a camel dies a natural death: nor does the camel yield milk except during autumn, when the luxuriant herbage induced by the rains has enabled it to recruit its strength. Flour is prepared from the grains of millet *(Panicum colonum)*, but dates are principally imported from Fezzan and other neighbouring countries, for those cultivated in the valley of Bardai do not suffice for the wants of the population. In times of scarcity the Tibbu has recourse to the innutritious shell of the Dum-palm fruit, an article of food not capable of itself to sustain life.

Nachtigall had now entered upon the hilly country of Tibesti, and first of all turned up the beautiful valley of Zuar, where water is plentiful, the vegetation luxuriant, and the scenery most picturesque, and animal life, though confined, as far as his observations went, to monkeys, gazelles, and birds, imparts some animation to the scene. It was in this charming valley that Nachtigall first experienced the rapacious and intolerant spirit of the Tibbu. On the 18th July he reached Zuar, where certain notables, who had already levied black-mail upon him during his progress up the valley, frustrated his intention of proceeding further to the south. Reluctantly our traveller retraced his steps to Tao, and there now remained two courses open to him, viz., either to return to Fezzan, or to make an attempt to reach Bardai, the hot spring near which exercised an almost irresistible attraction. Nachtigall was fully aware of the intolerant spirit which the Bardais were in the habit of exhibiting towards strangers, and of their rapacity and lawlessness, but he nevertheless resolved to venture upon the enterprise. As a precaution, however, he sent a messenger to Bardai, in order to obtain the permission of the Sultan. The messenger promised to return within eight days, but did so only after an absence of sixteen, during which the supplies of food were rapidly being exhausted. The Sultan had granted the desired permission, much against the will of his subjects, and Nachtigall resolved to avail himself of it.

On the 5th of August he left Tao. The hills, through which his route now led, consisted of sandstone overlying limestone. Blocks of basalt lay scattered about, and, on approaching the summit of the pass, the porous rock already noticed was again met with, covering large tracts of country. Not far from the pass, Nachtigall came upon a remarkable natron cavity of cup-like or circular shape, and having a circumference of 10 to 15 miles. At the bottom of this there rose a conical hill, having a crater on the top, the interior of which was filled with natron. The Tusidde, the highest summit of Tibesti, rose about 1200 feet above the pass to a height of 7900 feet. Descending the eastern slope of the mountain range, Nachtigall entered Bardai, after a journey of six days. His reception on the part of the populace was far from friendly; Muhammadan fanatics, excited by the immoderate use of palm-wine, called upon the multitude to slay the Christian dog, and it was only owing to the personal interference of Arami, one of the most influential chiefs, that Nachtigall was able to reach his protector's house in safety. There he was kept a strict prisoner. The Sultan refused to receive him; and of the pretty town of Bardai, with its detached huts of palm leaves, surrounded by gardens and date plantations, he was able to see but little. There being no prospect of further explorations, Nachtigall was anxious to return to Fezzan, and after much persuasion his kind protector consented to facilitate his flight. During the night of the 3rd of September, Nachtigall, with his servants, secretly left the town, accompanied for some distance by his protector; and after very rapid and fatiguing marches, travelling sometimes for thirteen hours a day, he again reached the wells of Tymmo, on the 20th September. The exhausted condition of his camels and servants ren-

dering a few days' rest absolutely necessary, Nachtigall stayed here during three days, and then left for Murzuk. Having secreted his remaining baggage amongst the rocks, he started on the 23rd September, each man carrying a supply of fifty dates, which was to last for five days. On the second day the camels succumbed, and had to be abandoned, but our weary travellers struggled on manfully, and on the fifth day after their departure they were rewarded by the sight of the verdant palm-trees of Tejerri. There Nachtigall purchased a donkey, on credit, and on the 8th of October he was back at Murzuk, much exhausted from the hardships through which he had passed, but nothing daunted in the task of exploration which he had imposed upon himself.

After another prolonged stay at Murzuk, Nachtigall was at length able to leave that town on the 18th of April 1870, and which he did in the company of an ambassador despatched by the Pasha of Tripolis to the Sheikh of Bornu. His journey, from circumstances beyond his control, took place during the hottest part of the year, and at Bilma, where the temperature during the day rarely sunk under 113° Fahrenheit, he suffered particularly from the heat. On the 6th of July the caravan entered Kuka, the capital of Bornu, having been received outside the town by Bu Bekr, the son of Sheikh Omar, attended by a brilliant suite, amongst which were many Arabs and Tibbu, splendidly mounted. The cavalcade proceeded to the square in front of the palace, where the Sheikh, himself unseen, mustered it, and on the following day Nachtigall was admitted to an audience. He handed over on that occasion the presents of which he was the bearer. They consisted of a gilded throne, of portraits of the Emperor, the Empress, and the Crown Prince, which highly flattered the recipient; a clock with an allegorical figure, which shocked his Muhammadan prejudices; a number of needle-guns, which restored his good humour; a gold watch, telescopes, velvets, &c. Rohlfs had added to these Imperial gifts a harmonium; and after the damage due to the intense heat of the desert had to some degree been repaired by Nachtigall's Italian servant, the instrument emitted sounds sufficiently melodious to "soothe the savage breast."

Nachtigall stayed at Kuka uninterruptedly for more than eight months, and industriously availed himself of this enforced leisure for collecting materials on the geography of Bornu and the neighbouring countries. The Sheikh throughout that period, and until his final departure, treated him with the greatest kindness and consideration; and had it not been for his patronage, our traveller would probably not have achieved the success of which he is now able to boast. The rainy season of 1870 proved unusually heavy; the streets of Kuka were flooded, and the inhabitants of the islands in Lake Tsad and those of the shore villages abandoned their habitations. The excessively wet season brought on malaria, to which not only Arabs, but likewise the negroes (who are sometimes supposed to enjoy immunity from this disease), and even horses succumbed. The cattle disease, which has been ravaging the herds of Bornu during the last three years (the herd of one rich proprietor having been reduced from 31,000 to 300 head) must, however, be traced to some other cause. The only redeeming feature of these heavy rains consists in the exceptionally bountiful harvest, for in November the cwt. of millet or dukhn sold at Kuka for 1*s.* 10*d.*, and that of wheat for 4*s.* 6*d.*

Nachtigall, during his lengthened stay in Tripoli, Murzuk, and the Sudan, had many opportunities of seeing whether the laws for the suppression of the slave-trade, forced upon the Turkish Government by the Christian powers, were being carried out. In his opinion, they remain a dead-letter. The very ambassador who accompanied him to Kuka was charged to state that no further difficulty would be placed in the conduct of that traffic, and a caravan with 1000 slaves, all in chains, actually left for the north during Nachtigall's sojourn. The Governor of Fezzan is in the habit of levying a tax upon each slave imported, on payment of which they are allowed to be taken to Tripoli. There a further payment is exacted; and after the slaves have reached their various destinations, the public are reminded that there are laws in force which forbid this traffic. A young male slave now fetches in Kuka about 3*l.*, a good-looking young female from 5*l.* to 8*l.* and more; and as slaves are more readily procurable in Bornu than more legitimate articles of merchandise, they constitute almost the only article of export. Yet were a government to be established in these Central African countries determined to develop the vast natural resources of the country, the slave-trade might readily be abandoned in favour of more legitimate pursuits, without detriment to the wealth of the inhabitants.

After this lengthened stay at Kuka, Dr. Nachtigall, being obliged to borrow the necessary funds at usurious interest (for the moneys forwarded to him from Europe never reached their destination), and owing part of his equipment to the kindness of Sheikh Omar, was enabled to leave Kuka on his first exploratory expedition. It was his object to visit Kanem and the countries to the north-east of it, and the powerful Arab tribe of the Welad Sliman had undertaken to act as his protectors. Soon after his departure, which took place in the beginning of March 1871, Dr. Nachtigall fell ill, and was almost on the point of giving up his proposed journey. But a plentiful supply of camel's milk somewhat restored his failing health, and he persisted in his original plan. The country from Lake Tsad, as far as Birfo, where our traveller arrived on the 2nd May, and which lies on the frontiers of Kanem at a distance of some 130 miles from the lake, rises gradually. The road then descends into the lowland of Egai, and (having traversed a desert tract, three days wide) into that of Bodele, or Battele, which is of considerable extent, and probably communicates with Egai. Crossing this lowland in a north-easterly direction, our traveller after an exceedingly fatiguing march, reached the celebrated spring of Gelakka, in Borku, on the 31st of May. The journey thither had been attended by considerable difficulties, traceable to a great extent to the want of funds. His camels dead, his horse worn to a skeleton, himself reduced to a wretched diet of dates and millet-porridge, Nachtigall's sufferings were still further aggravated by the preachings of a Muhammadan missionary, who taught that the murder of a Christian would prove the most certain means of reaching paradise. Under these circumstances, his proposed journeys to Wadyanga and Ennedi had to be given up, and it was fortunate that his Arab pro-

tectors, who had shown symptoms of leaving him to his fate, finally determined to stand by him. On the 23rd September he was able to start on his return journey, but being obliged to lead his worn-out horse, his progress was but slow. He paid a visit to Mao, where he thanked the generous man who had procured decent burial for the unfortunate Beurmann, and on the 9th January he re-entered Kuka. The Sheikh, as ever, received him most kindly, presented him with a horse, and re-equipped him; but his hopes of finding fresh funds for continuing his explorations were doomed to disappointment, for all that had arrived consisted of the modest sum of 50*l*.

The results of this journey are highly important from a geographical point of view, and throw fresh light upon the features of the Southern Sahara. Lake Tsad, with its numerous islands, appears to vary considerably in size according to the abundance of the rains, and at a former period discharged its surplus waters through the Bahr-el-Ghazal, 300 miles in length, in a north-easterly direction into an extensive lake, which then occupied the whole of the extensive depression of Bodele. The course of this ancient river can still be traced by a fringe of trees, and the existence of an old lake is proved by numerous skeletons of fishes and other animals found upon its ancient bed. The Welad Sliman even assert that Lake Tsad, after the unusually heavy rains of 1870, once more overflowed its banks in the direction of Bodele, and formed a river about 100 miles in length. From Bodele and Borku, the lofty hills of Tibesti can be seen in the distance, and not far from Borku there is a remarkable mountain, the Kussi, which equals the Tarso in height, and at the foot of which there is a hot spring, and a gigantic crater filled with sulphur and natron. From information gathered on the spot it would appear that the mountains of Tibesti are actually connected with the Jebel Marra of Wadai. The Welad Sliman, who usually reside in Kanem, because it lies nearer to markets, look upon Bodele and Borku as tributary territories. Once every three or four years they visit the fertile date plantations of Borku, appropriate the date harvest, and recruit their health and that of their camels in the more invigorating climate of that much-suffering province. Under these circumstances it need not excite surprise if we find that the 5000 sedentary inhabitants of Borku do not cultivate their fields with particular care, for they but rarely reap the fruit of their labour. The Welad Sliman, though they migrated to Kanem some forty years ago, have preserved the pure Arab type, for they brought with them their families. Not so the Mgharba, who, like the former, immigrated from Barka, and now live amongst them. Having left their wives at home, they have largely intermingled with the neighbouring Tibbu and negro populations. Wadyanga and Ennedi, to the north-east and east of Borku, are inhabited by Bele or Terrāwia, who differ from the Tibbu in language and traditions, and are probably kindred to the Zoghawa of Western Sudan.

Soon after his return to Kuka, Dr. Nachtigall started upon a fresh expedition. On this occasion the object of his journey was Bagirmi, one of the tributary states of Wadai, but at that time in a very unsettled condition. Sultan Ali of Wadai appears to be ambitious of establishing a powerful empire in the heart of Africa, and being still a young man, and possessed of qualities calculated to ensure success, he may be destined to succeed in his aim, especially as his once powerful neighbour, Bornu, is evidently in a decaying condition. The people of Wadai are warlike, and the majority are devoted to their sovereign and his policy. Still, in the eyes of the old Wadawi, Sheikh Ali is merely an usurper; the preference which he gives to the Arabs, and the contempt with which he treats the ancient usages of the country, are not calculated to propitiate their favour. Sultan Muhammad of Bagirmi had long been impatient of the yoke imposed upon him by the ruler of Wadai, and made no secret of the contempt he felt for him. Sheikh Ali's patience was at length exhausted; in 1870 he took the field, and after a siege of two months he succeeded in capturing Massenya, the walled capital of Bagirmi. Muhammad, however, and many of his adherents, managed to escape, and in the southern portions of his dominions he still continued to offer resistance. It was there that Nachtigall proposed to visit him, and accompanied by a messenger of the Sheikh of Bornu, he left Kuka on the 27th of February 1872, for that purpose. Two bullocks carried his baggage, and a serviceable aneroid and two thermometers enabled him to observe altitudes. This first part of his journey led through districts which are familiar to us from Barth's descriptions, but many towns which twenty years ago were described as populous, were now found to be almost deserted, for their populations had followed a fanatical Pullo pilgrim, whose preachings induced many Muhammadans of Bornu to rally round his standard for the purpose of accomplishing a pilgrimage to Mekka. When Sherif ed Din arrived on the frontiers of Bagirmi his followers constituted a formidable army. The predecessor of the present Sultan, dreading this influential fanatic, sought to conciliate him, but Sherif ed Din treated his offers with contempt; a sanguinary battle ensued, in which the Sultan forfeited his life, and the Sherif was free to pursue his course. He directed his steps towards the heathen countries of the south, but there met with unexpected resistance. The natives having concealed their stores of grain, supplies began to fail, many of his followers deserted, and the Sherif himself was slain whilst on a Ghazzia.

On the 14th of March Nachtigall entered Logonbirni or Karnak-logon, a large town of 12,000 inhabitants, situated on the river Ba-logon, here 300 yards wide. The governor of the town, though not friendly disposed towards the deposed Sultan, nevertheless permitted Nachtigall to proceed, and this in spite of the horse-dealers, who had joined his caravan in the hope of being able to sell their horses on advantageous terms at Muhammad's camp. The Shari was crossed at Miskin, where it is 420 yards wide and of considerable depth, and the caravan then followed the banks of that river as far as Mafalin, the numerous island villagers refusing to admit it for fear of the depredations which might be committed. At Mafalin Nachtigall turned to the south, and, passing many deserted villages, he reached the Sultan's camp, in the territory of the Gaberi, on the 4th of April. The king, whose temporary capital consisted of about 1000 huts surrounding a large square, received our traveller in the most affable manner, and even permitted him to enter the royal presence in stockings, although the custom of the country required that none should appear before the

king except bare-footed, and with the upper part of the body uncovered. The ammunition and the horses brought by Nachtigall's caravan no doubt had some share in this favourable reception. Nachtigall's movements were left unfettered, and he accompanied several raids directed against neighbouring villages for the sake of grain and slaves. Frequently the heathen natives were able to baffle the attempts of their pursuers. They deserted their ordinary dwellings, and with their stores and cattle took refuge in the branches of gigantic bombax trees, where they built platforms, several families frequently finding shelter on the same tree. These trees could not be assaulted except at the sacrifice of many lives, and as the Bagirmis were not furnished with implements for felling them, they were fain to content themselves with now and then picking off one of the refugees with their muskets, and when the body dropped they mutilated it in the most barbarous manner.

When supplies began to fail, the Sultan shifted his camp to Gundi, the capital of Tummok, carrying by assault a village on the road, and killing or enslaving the whole of its inhabitants. On this occasion Nachtigall was wounded by a spear, which nearly put a a stop to further explorations. The Sultan was somewhat reluctant to part with our traveller. However, on the 30th July, Nachtigall was able to start on his return journey. He travelled in company with a caravan carrying slaves to Kuka, and was compelled to witness the revolting conduct of the slave-dealers, who mercilessly cut the throats of their victims whenever the whip failed in inducing them to struggle on. On the 7th September he was back at Kuka, and as usual was most kindly received by the Sheikh.

This journey to Bagirmi has added much to our knowledge of the Shari and its many branches, which shrink into a series of pools during the dry season, and also of the heathen populations of the south. With respect to these latter, a few remarks may be acceptable: they apply in the first instance to the Somrai, but are more or less applicable to many other tribes.

The Somrai are negroes of middle height and regular features, and only in few instances are they repulsively ugly. The men have the advantage of the other sex as regards features, though far inferior to it in figure. The dress of the men consists of a scanty piece of the skin of a goat, gazelle, or wild cat worn round the loins. They bestow the utmost care upon their hair, which they dress in the most extravagant styles, wearing it sometimes in small tresses arranged in ridges, in puffs projecting like horns from the four corners of the head, or in a conical structure built up on the forehead. Their arms consist of an iron knife and lance; footmen carry narrow shields of buffalo hide or wickerwork, 6 feet in length. They are good horsemen, and ride their active ponies—the backs of which are rendered sore by artificial means—without saddles or stirrups. The dress of the women is even more scanty than that of the men, for it consists merely of a thin rope or string of beads passed round the loins and between the legs, and tied in front. In addition to this they wear leather garters ornamented with kauri-shells, and bead necklaces, and pass a glass cylinder or a bit of wood through one or both lips. They either shave the whole of the head, or at all events the forehead, and in the latter case the hair is cut short. Both sexes cut out one of their incisors.

The Somrai believe in a supreme being who speaks to them through the thunder. The symbol of this deity consists of the portion of a trunk from which the bark has been peeled off in rings, and which is placed in a small hut near the dwelling-houses. Women and children are not admitted to this hut, where sacrifices of all kinds, including the *genitalia* of enemies slain in battle are deposited. Sorcery is firmly believed in; and the death of eminent persons, or even of favourite horses, is invariably ascribed to the action of a sorcerer, for whose discovery different stratagems are resorted to by each tribe. In Somrai the deceased person is placed on the heads of two men, when the feet will invariably turn in the direction of the house of the guilty person, on reaching which the bearers are supposed to be unable to proceed any further. The sorcerer is then brought out and killed, and his family sold into slavery. Persons subject to epileptic fits are supposed to be possessed of the devil and are likewise killed.

The dead are buried in circular graves, and with them is placed a goat, a few jugs of honey and melèssa (millet beer), and a cup filled with kauris. The Nyellem and several other tribes are in the habit of burying a living boy and girl with deceased chiefs, to keep off the flies, as they say; but this barbarous custom is now falling into disuse.

Polygamy, as might have been expected, is customary, and the number of wives merely depends upon the power of paying the required number of horses or dogs to the parents of the bride. Wives bearing no children may be sold into slavery, but after a wife has borne three children, she may return to her parents, the husband being supposed, in that case, to have received a fair equivalent for his purchase-money. The Somrai, as well as the other heathen tribes to the south of Bagirmi, are industrious cultivators of the soil, durra being their principal grain, which they exchange for tobacco, beads, and kauris. The villages are imbedded in groves of giraffe (karage) trees, Deleb and Dum palms, kautchuk and fig trees. The houses are of straw, with the exception of the grain store, which is a conical structure of clay, having its only opening on the top. Goats, sheep, and dogs are kept in addition to horses, and dogs are particularly valued as an article of food. Horned cattle are comparatively rare, and the domestic cat appears to be a stranger to these tribes.

We will now accompany Dr. Nachtigall on his last journey, through Wadai to Darfur, concerning which our information is still exceedingly meagre. He left Kuka in the beginning of March 1873, and passing to the south of Lake Tsad by way of Fittri, a month's journey brought him to Abeshr, which, since the destruction of Wara, is the capital of Wadai. Sheikh Ali received him with unexpected kindness, and placed no restrictions whatever upon his movements. Nachtigall, for a considerable time, led a retired life, partly because his want of funds precluded him from defraying the expenses of fitting out an expedition, partly because he feared to arouse the suspicions of the king; partly because in his then state of health, his desires were limited to reaching Egypt by way of Darfur. But with returning health his spirit of enterprise was again aroused, and when he found that political disturbances in Darfur would preclude him from leaving the country for a considerable time to come, he eagerly embraced an opportunity

of visiting Dar Runga, one of the vassal states of Wadai, situated twelve days' journey to the south of the capital. He left Abeshr about the middle of August 1873, travelling in the company of a small body of horsemen, who escorted a newly appointed viceroy. Crossing the Bahar es Salamat the northern frontier of Dar Runga is reached in twelve days. Runga itself is a country of considerable extent, stretching southwards to about latitude 8° N. The Runga proper are Muhammadans, but the kindred tribe of the Kuti, in the south-western part of the country, are still heathen. Merchants from Darbanda and Bornu have established themselves in their district, and most of the ivory which reaches Darfur from Wadai is obtained there. The rivers of Runga flow westwards to the Shari, and the Bahar Kuta, a considerable river seven days beyond its southern boundary, is probably identical with Schweinfurth's Welle.

No details concerning Nachtigall's explorations in Wadai have hitherto reached us, but we learn from Khartum that a messenger despatched thence with supplies met him at the capital of Darfur, where he had arrived on the 17th of March 1874, in the company of an ambassador proceeding from the Sultan of Wadai to the Khedive. Our dauntless traveller had thus accomplished the most difficult portion of his journey to the east, and news of his safe arrival in Egypt may hourly be expected.*

Geographers who have followed with some attention the progress of African exploration cannot fail to appreciate the importance of Nachtigall's researches. He has unclosed to us the geography of a considerable portion of the Eastern Sahara; enlarged our knowledge of Bagirmi, and by his journey through Wadai and Darfur supplied us with a means of checking and utilizing the vast mass of information derived from native sources. His experience has shown that travelling in these countries is not necessarily attended with dangers of an unusual kind. Let us hope that his success may attract other travellers to the field of research so successfully cultivated by him, and that he may live long enough to enable him to boast not only of having achieved great things himself, but of having been the cause of still greater achievements on the part of others.

E. G. RAVENSTEIN.

* Since writing the above Dr. Schweinfurth has received a telegram from Khartum announcing Nachtigall's arrival in Kordofan.

THE NORTH AMERICAN BOUNDARY SURVEY.

THE paper, which was read at the last meeting of the British Association, consisted of two reports by Captain Anderson, R.E., dated the 31st of May 1873 and 16th of March 1874 respectively. In the former of these reports, Captain Anderson says—"The officers and detachment of forty-four Royal Engineers left Liverpool on the 22nd of August 1872, with an outfit of all special stores and instruments required for the expedition. Proceeding *viâ* Quebec and the Canadian lakes to the western extremity of Lake Superior, the party travelled through the State of Minnesota by rail, to the head waters of Red River, thence, partly by marching and partly by river transport, reached the frontier at Pembina, Red River, on the 20th of September.

The Staff of H.M.'s Commission consisted of the commissioner (Captain Cameron, R.A.), chief astronomer (Capt. Anderson, R.E.), two assistant-astronomers (Capt. Featherstonhaugh, R.E., and Lieut. Galwey, R.E.), two surveying officers, secretary (Capt. Ward, R.E.), surgeon, veterinary surgeon, and naturalist.

Three astronomical parties were organized under the respective astronomers; two surveying parties, under the surveying officers; and an additional surveying party under Serjeant Kay, R.E. The astronomical and surveying parties left the head-quarters camp on the 1st of October, and proceeded to commence operations at different points near the boundary between Red River and the Lake of the Woods. Light four-wheeled, two-horsed waggons were used for transport over the open country by the astronomical parties, and light two-wheeled country carts, drawn by ponies, were used by the surveying parties, who also employed canoes in districts where water transport could be used with advantage. Depôts for provisions and stores were formed at convenient points along the boundary, from which the working parties were supplied. The month of October was very favourable for work, but the country between Red River and the Lake of the Woods being very swampy, surveying operations were attended with much difficulty, till the frost set in on the 11th of November. The boundary line was determined at points 20 to 30 miles interval by zenith telescope observations, giving a result, with a probable error in latitude of ± 10 feet, and from the principal points, fixed astronomically surveyed lines were traced connecting the several stations. At the same time a survey on the scale of 4 inches to 1 mile was made of the country extending for 6 miles north of the boundary. The work was continued throughout the winter, that being the only season in which the swamps could have been surveyed, and when the cold weather set in, a liberal supply of buffalo robes and leather suits were issued to the men, and a small sheet-iron box stove for every tent. As the winter advanced the supplies were sent out to the depôts on sledges, and distributed to the working parties by ponies with flat trains or 'tobogans,' and latterly by hand sleds and dog trains, when the snow became too deep to travel. The work was continued uninterruptedly till the winter broke up, and the survey in this section being finished, the rearmost party returned to head-quarters on the 5th of April, travelling with dog trains through the swamps, which were now continuous water and mud.

A summary of the work accomplished by Her Majesty's Boundary Commission, from the 20th of Sept. to the 5th of April, may be briefly stated as follows:—

The determination of five principal astronomical stations, viz., Pembina, West Roseau, Pine River, Lake of the Woods, and North-West Angle.

The tracing of sight lines near the boundary throughout, from Red River to the Lake of the Woods, a distance of 88½ miles.

The demarcation of the corrected boundary-line from the Lake of the Woods westerly for 32 miles, to the adjoining astronomical station.

The tracing of the due south line from the initial point of the boundary at the north-west point of the Lake of the Woods, to the open lake, 16 miles.

The determination of the longitude of Pembina by electric telegraph from Chicago Observatory.

A survey by triangulation and traverse of the North-West Bay, and west shore of the Lake of the Woods.

A survey of the 6-mile belt of the country north of the boundary from Red River to the Lake of the Woods, covering an area of 530 square miles.

A line of instrument levels along the boundary from the Lake of the Woods for 48 miles westerly, supplemented by simultaneous readings of aneroid barometers for difference of level, at different points over the whole country examined during the season.

A complete set of magnetic observations at Pembina and North-West Angle stations.

A series of meteorological observations at Pembina, taken continuously from the 1st of October to the present date, and a corresponding set at the Lake of the Woods from the 11th of October to the 10th of December.

Forty photographic views taken during the progress of the work.

The boundary-line surveyed during the past winter commences in a swamp at the north-west point of the Lake of the Woods, and extends due south for 16 miles through tamarac and cedar morass. This swamp has a mossy covering, which is very treacherous, giving way under foot, and underneath is stagnant water, 3 to 4 feet deep and generally a gravelly bottom. This stagnant water does not freeze in winter. After passing through 16 miles of this swamp the boundary enters the open lake, and continues due south for 12 miles across the lake till it strikes the 49th parallel of N. latitude, which it then follows westerly, still in the waters of the lake, for 5 miles to the western shore of the lake. It then passes through a narrow belt of poplar, and crosses an open swamp 2 miles wide, then strikes into willow bushes and stunted growth of tamarac trees, and afterwards a thick growth of cedar, birch, and tamarac. Then, traversing the north end of a swamp, and through 2 miles of 'windfall,' it crosses, at 17 miles from the lake, the East Roseau River. From this point, for 9 miles westerly, the boundary passes over slightly elevated ground, covered with dense spruce and cedar, and, in places, a great entanglement of 'windfall.' The district to the north was formerly covered with Norway pine, but has been devastated by fire, and is now covered with a confused mass of brulé and 'windfall.' After crossing a narrow, gravelly ridge, where a few Norway pine occur, and 26 miles from the lake, the line crosses the Pine River swamp, which is 6 miles wide, and after passing through 3 miles of tamarac and spruce beyond this swamp, it traverses the Great Roseau swamp, 12 miles in width. The line then enters a forest of spruce and cedar extending for 11 miles over dry gravelly ground to the crossing of the Roseau River, the waters of which are nearly on a level with the adjacent country. From this crossing, which is 55 miles from the Lake of the Woods, the boundary passes over continuous swamps for 13 miles, through poplar islands, and among granite boulders, and then crosses a ridge with a fine gravelly plateau. It then traverses a low-lying level, with swamps and poplar islands at intervals, till a second ridge is reached, 76 miles from the lake. From this ridge, which is raised 30 feet above the adjacent prairie, the boundary passes over a stretch of dry, open prairie for 9 miles, and for a further distance of 3 miles to the Red River, through a scattered growth of elm, scrub, oak, and poplar, 88½ miles from the Lake of the Woods, in which distance there is a fall westerly of 340 feet. At Red River the water flows between steep, muddy banks, 34 feet below the prairie level, and the clay subsoil has a top-dressing of rich, alluvial black mould. With the exception of the prairie land for 14 miles east of Red River, the country along the boundary between Red River and the Lake of the Woods is not fit for cultivation.

A short account of the progress of the seasons during the period now under consideration may be considered of interest. Winter set in on the 11th of November, and continued till the 1st of April. During this interval of 141 days the maximum thermometer on eight occasions only rose above freezing point. Ice began to form on Red River on the 11th of November, and three days later it was safe to cross on foot. The ice reached a maximum thickness of 40 inches by the end of February, and by that date the ground was frozen to a depth of 76 inches. The snow on the prairie reached a maximum depth of 27 inches. The river was clear of ice on the 28th of April. The mean temperature for the successive months was as follows :—

October +41°, November +16°, December −7°, January −7°, February +2°, March +10°. The lowest temperature registered was 51° below zero on the 24th of December. A terrific snowstorm swept over the country and lasted for three days—7th, 8th and 9th of January—causing a loss of 250 lives in Minnesota. The boundary parties, who were all in the field at the time, scattered at different points along the line, escaped with only a few frostbites."

In his despatch of the 16th of March 1874, Captain Anderson says: "The organization of the working parties throughout the season was as follows:—One reconnaissance party; two astronomical parties; three surveying parties; the strength of the commission during the working season numbering 275 persons.

The field operations were conducted in the following order :—

1. The reconnaissance; 2. The establishment of the astronomical stations, and the connection of the stations, by surveyed lines, both these operations being carried out by the astronomical parties; 3. The topographical survey of a belt of country along the boundary in British territory.

The object of the reconnaissance was to explore the country in advance of the working parties, to find wood and water, to determine the sites for the astronomical stations, the sites for the commissariat depôts, and to mark out the line of travel to be followed by the working parties, as well as the routes to be taken by the commissariat trains. Principal depôts for supplies were established along the main line of communications, at intervals varying from 120 to 150 miles, and sub-depôts at intervals of from 50 to 75 miles. A corps of seventy-five half-bred scouts, armed with breech-loading carbines and mounted on Red River horses, was organised for escort duty. The scouts, in parties of two, were distributed 2 to 3 miles in advance, and the same distance on each flank of the waggon train, to give early information of the approach of Indians, and to examine the country for water. The exploration across the great plains necessitated the

same method of working as at sea—that is to say, ascertaining the latitude with the sextant, finding the time, and deducing the difference of longitude from chronometers, and in the absence of land-marks, the line of travel, being as nearly as possible due west, was guided solely by compass. Five reconnaissances were made during the summer season of 1873, exploring the country for 90 to 100 miles due west on each expedition. The instruments used on the reconnaissance were an ordinary 8-inch nautical sextant, artificial horizon, a prismatic compass and four pocket chronometers. The chronometers gave excellent determinations for the distance travelled. The general rate of travel with two-horsed waggons, loaded with about 1200 lbs. weight, was 3¼ miles per hour, or 22½ miles per day.

The astronomical and surveying parties worked independently, each party having entire control over its own transport train, but depending for supplies of food and forage on the depôts which were established and stocked as the work advanced. The principal commissariat trains travelled backwards and forwards on the main line of communications only, while smaller trains were attached to each depôt for local employment, and delivered supplies at the different camps. For some sections of the work, in addition to supplies of food and forage, both wood and water had to be carried. The water was carried in specially made water-carts arranged for single draught. As the work was pushed forward, the line of communications gradually lengthened out westwards, till the 10th of October, when, as previously arranged, field operations were suspended, and each party independently retreated to winter-quarters at Red River, the rearmost party arriving there on the 31st of October, three days after the closing of the river. The winter had set in a fortnight earlier than usual, and navigation, which had commenced on the 1st of May, was suddenly stopped on the 28th of October. The river-steamers were frozen in at points of the river where they happened to be on that date, and have been compelled to pass the winter in very inconvenient places.

A summary of the work accomplished by Her Majesty's Boundary Commission during the summer season of 1873 may be briefly stated as follows:—

1. A reconnaissance of the boundary line and the country to the north of it for a distance of 437 miles due west of the Red River, based upon a series of latitudes and longitudes astronomically determined at thirty-eight points.

2. The determination of ten principal astronomical stations, established by zenith telescope observations, near the boundary.

3. The tracing and chaining of surveyed lines connecting the astronomical stations, and the construction of earthern mounds, in conjunction with the United States Commission, along 408 miles of continuous boundary line west of Red River, the British Commission accomplishing an aggregate of 220 miles, including 8½ miles cutting through the wooded district of Pembina Mountain, and 24½ miles of cutting through Turtle Mountain.

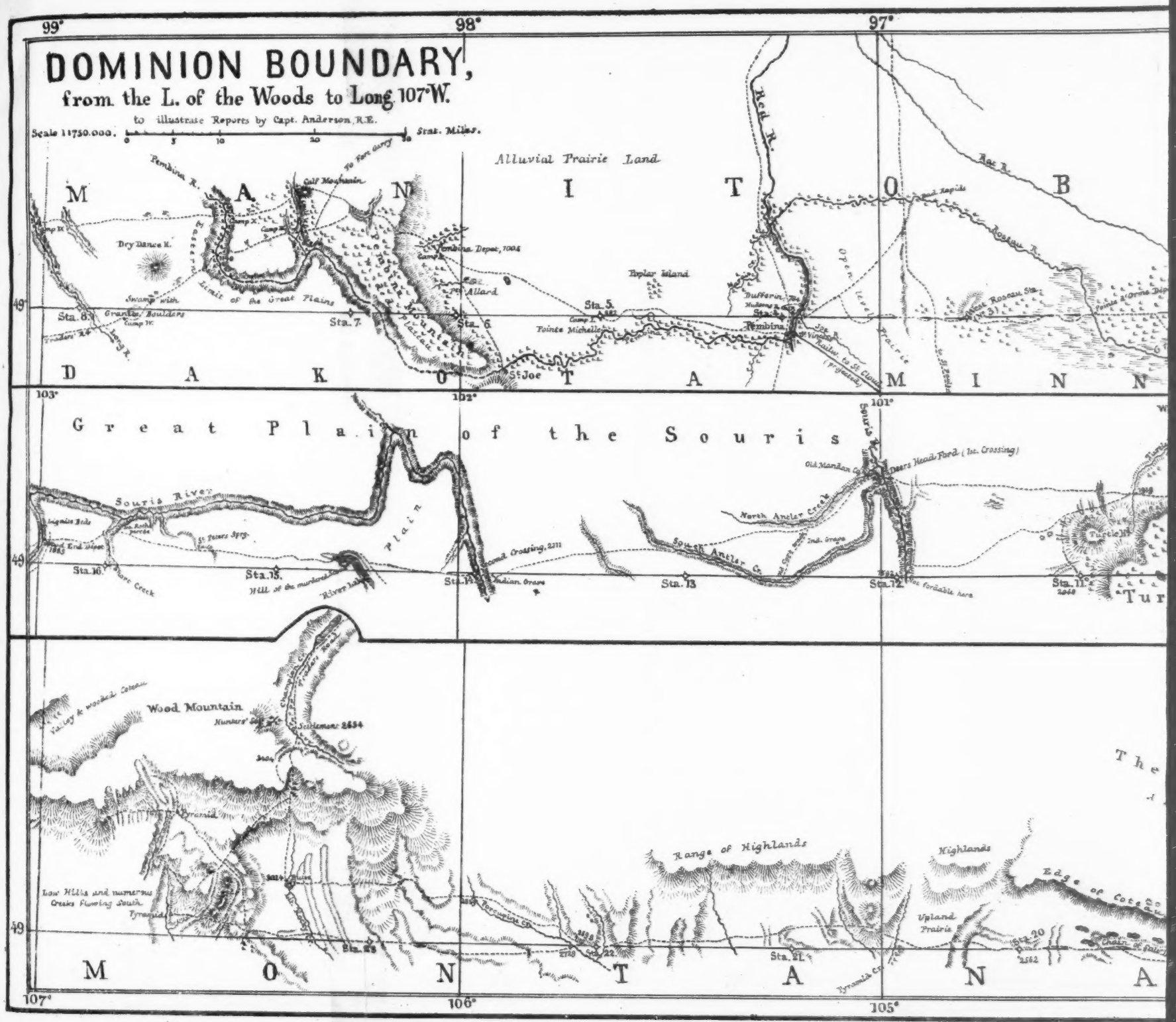
4. A topographical survey of the country north of the boundary for a width of from 6 to 15 miles, from Red River for 400 miles due west, plotted on a scale of 4 inches to 1 mile. This survey covers 3004 square miles of country.

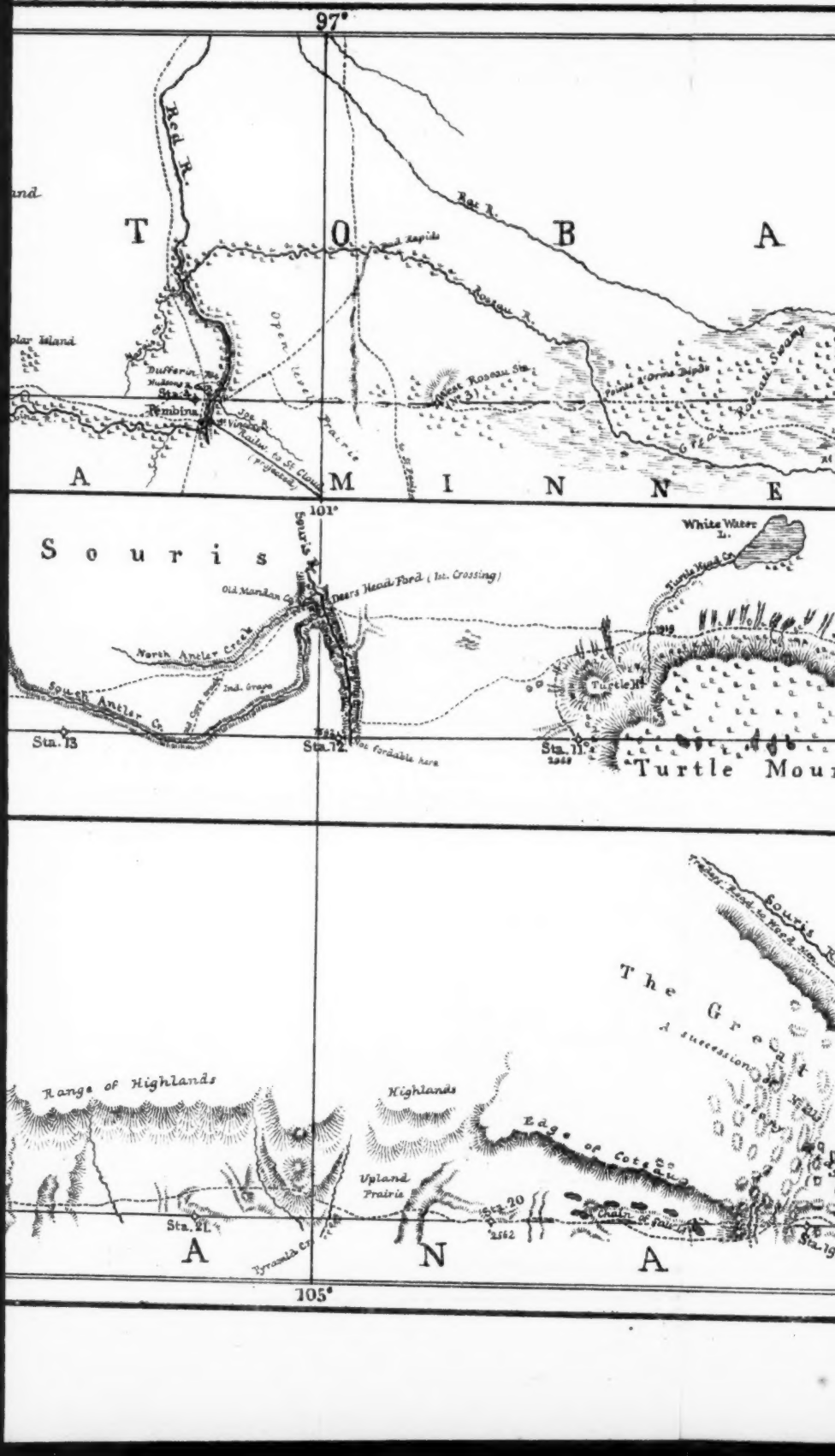
5. A series of meteorological observations at Red River for the whole of 1873, in addition to magnetic and barometrical observations taken by the working parties in the field.

6. A series of 129 photographic views, illustrative of different portions of the boundary and adjacent country."

The following notes are submitted descriptive of the country traversed by the international boundary line from Red River to the westernmost point explored last season. At the boundary crossing Red River is 75 yards wide, 10 feet deep at its mean summer level, and flows northward with a current of 2½ miles per hour. The river at the frontier line is 752 feet above the sea level, and 34 feet below the general prairie level. From this point westerly the boundary crosses 35 miles of alluvial prairie land, well suited for the growth of cereals and vegetables. The boundary then enters, by a gradual ascent, a wooded district, called Pembina Mountain, the first prairie steppe, and after traversing 12 miles of a very rugged and wooded country enters upon the great plains, at an elevation of 1400 feet above the sea. These plains have a poor gravelly soil, with numerous granitic boulders scattered in all directions, and patches of luxuriant grass grow here and there in hollows, where moisture remains and keeps the grass green for two or three weeks after the general prairie is scorched by the heat of the sun. After entering the great plains no wood or permanent supply of water is met with along the boundary, for a distance of 68 miles. The latter portion of this district is undulating, like a land sea, and occasionally on the plain there is a little eminence or "butte," from which the vastness and monotony of the plain in every direction may be seen and realized. In consequence of the poorness of the soil, the frequency of night frosts during the summer, and the scorching heat of the sun during the summer months, these plains are not suited for the growth of cereals, but pasture is plentiful, and there is seldom any difficulty in finding swamp water in some of the low-lying hollows. Innumerable and well-defined buffalo trails cross and recross these plains in every direction, and the bleached skulls and bones of the buffalo killed in the wholesale battues of former years are scattered on all sides. The commonest animal now met with on the plains is the badger, and the prairies are completely honey-combed by badger holes.

After traversing 68 miles of plain the boundary enters, by an ascent of 200 feet, a well wooded plateau called Turtle Mountain, full of lakes and little swamps; and this feature, which extends for 30 miles to the south, protrudes into British territory, so that the boundary in its westward course passes through 34 miles of the wood, lakes, and swamps of Turtle Mountain before emerging again on the plain. The plains then continue for 138 miles further west, at an average elevation of 2000 feet above the sea, the soil becoming sandy, supporting a scant herbage of bunch-grass, and affording pasture for a few herds of antelopes. The great plains in this section of the country come to an end 280 miles from Red River, and the boundary, by a gradual ascent of 250 feet, enters the very marked feature called the Great Côteau, the second prairie steppe, which crosses the country from north-west to south-east. This côteau leads to a very remarkable plateau 2250 feet above the sea, composed of a suc-


DOMINION BOUNDARY,
from the L. of the Woods to Long 107° W.
to illustrate Reports by Capt. Anderson, R.E.
Scale 1:750.000.
Stat. Miles.
99°
98°
97°
103°
102°
101°
107°
106°
105°
49°
Alluvial Prairie Land
Great Plain of the Souris
Wood Mountain
Range of Highlands
Highlands
Upland Prairie
Open level Prairie
Pembina R.
Red R.
Assiniboine R.
Souris River
Long R.
Dry Dance R.
Rosseau R.
Boyer R.
Pembina Mountain
Limit of the Great Plains
Gaff Mountain
Poplar Island
Pointe Michelle
Bufferin
Pembina
St Joe
Fort Ellice
Fort Garry
Old Mandan
Deers Head Ford (1st. Crossing)
North Antler Creek
South Antler Creek
Indian Grave
Hill of the murdered
Granite Boulders
Swamp with
Sta. 5
Sta. 6
Sta. 7
Sta. 8
Sta. 10
Sta. 11
Sta. 12
Sta. 13
Sta. 15
Sta. 16
Sta. 20
Sta. 21
Sta. 22
Sta. 23
Settlement 2634
Pyramid
Low Hills and numerous Creeks flowing South
Edge of Cote
Chain of Lakes


97°
Red R.
T O B A
Pembina
Souris
Old Mandan Ct.
Bears Head Ford (1st. Crossing)
North Antler Creek
South Antler Ck.
Sta. 13
Sta. 12
Not fordable here
Sta. 11
White Water L.
Turtle Mountain
Souris R.
The Great
Range of Highlands
Highlands
Edge of Coteau
Upland Prairie
Sta. 21
Sta. 20
A N A
105°

96°
95°
N.W. Point
North West Angle Sta.
White Mouth L.
Tamarac Swamp
Pine Section
Coteau Sta. (N°2)
Coteau Dépôt
Rosseau Lake
L. of the Woods Sta. (N°1)
L. OF THE WOODS
49
S O T A
100°
99°
Gravelly and undulating Plain
Turtle Dépôt
Sta. 10. (Camp VI.)
Sta. 9.
Traders Road
Mountain
Great Plain
Broken Prairie
Gravelly Desert
Arid Plain
Sta. 17.
Sta. 18
Sta. 19.
Coteau Dépôt 2242
Traders' Road
104°
103°

cession of ridges, valleys, and basins, presenting in section a very broken and irregular profile, and the whole district has the appearance of an ancient lake bottom upheaved. The boundary in its progress over this wild and weird country, crosses no well-defined ridge or watercourse, but the same confused monotony of ridges and hollows. This continues for 33 miles, when the boundary enters a country of alkaline lakes, which dry up during the autumn, and leave a white deposit which contrasts strikingly with a bright crimson plant growing on the margin of the lakes. The chain of alkaline lakes extends for 15 miles, and over the whole of this district, as well as the district of the Great Côteau, the waters have no outlet to the ocean. The boundary having crossed this great central water-parting, and leaving the waters that drain northwards into Hudson's Bay, comes upon the Missouri system of waters, which flow southwards into the gulf of Mexico. A great change is now observable in the topographical features. Owing to the nature of the soil, which is of clay and very friable, the rainfall has denuded the whole face of the country into deep ravines, and the ridges seen in profile against the sky line, have a very bold and rugged outline. The boundary crosses 30 miles of this very broken country of ravines and ridges, and then enters upon a more undulating country, crossing several fine creeks, bare of timber or bushes, and, at an elevation of 3300 feet, comes upon the heads of a series of rugged ravines opening out south-westward. Occasionally, in sheltered corners having a northern exposure, a few poplar and aspen are found. Wood, however, is very scarce, and there are two sections of the boundary, each 80 miles across, where no timber or brushwood is met with. Lignite coal was found in seams of 2 to 5 feet in thickness, and when mixed with wood and burnt in a stove, with a strong draught, answered very well for fuel. In the ravines at the westernmost point of last summer's exploration, two herds of buffalo, six in a herd, were seen, but the great herds are 200 miles further west. The great migration of the buffalo from the vicinity of Red River settlement, to the country 600 miles further west, has occurred within the last fifteen years.

The first half of the summer season did not prove very favourable for work on the plains. The constant mirage impeded surveying operations greatly during the day, and astronomical observations were much hindered by the incessant attacks of the mosquitoes at night. From 15th May to the middle of August mosquitoes swarm in myriads, and at night attack the horses so fiercely, that the stamping and snorting of the suffering animals may be heard throughout the night. Turf fires are kept going in front of the picket lines, and the smoke affords some relief, but it is only during the heat of the day, when the mosquitoes become torpid, that the horses are able to rest. In Pembina Mountain grasshoppers or locusts were met with in great numbers, and proved destructive to tents and clothing. The great plains are noted for the thunderstorms that occur two or three times every week in June and July. These storms usually give an hour's warning, and when the full force of the storm is overhead the plain is converted for the time into a vast lake, and frequently every tent in the camp is blown down during the fury of the storm. The lightning appears in balls of fire plunging into the ground, and in such quick succession that at night the air seems to be continually illuminated. The season of thunderstorms expiring early in August, was followed by six weeks' drought, and the prairie grass becoming parched, readily caught fire. For a period of two or three weeks prairie fires were very general, and it was only by incessant vigilance that the working parties saved their camps and their horses from the fire. By the 15th of September fires had swept through the country, and along the whole line of travel the ground was blackened, and as bare of herbage as the sea shore, except in occasional swamp holes, where small patches of grass had escaped the fire. In anticipation of the requirements of the return journey, hay was made and stacked at convenient intervals along the travelled route, so that the transport animals were amply provided with fodder on their homeward march to winter quarters. After the six weeks' drought the equinoctial snow storms set in on the 22nd of September, and caught all the working parties at different points on the plains. These storms set in with great violence from the north-west, and lasted, with occasional short lulls, for five days, during which period work was necessarily stopped, and the working parties made the best shelter they could for themselves and their horses. The supply of fuel at this period was just sufficient for cooking purposes. Twelve inches of snow fell during these storms, and the snow remained on the ground for three weeks, rendering both surveying operations and travelling very laborious at the end of the season.

AMERICAN EXPLORATION.

The Survey of Dr. F. V. Hayden.

Mr. Alvan S. Southworth, Secretary of the American Geographical Society, who represents that body with the Hayden Rocky Mountain Expedition, sends us a brief abstract of its labours as follows:—

"Professor Hayden arrived at Denver on the 15th of July, and immediately divided his expedition, consisting of sixty people and 120 horses and mules, into seven distinct sub-expeditions, the operations of each one of these bodies being so directed as not to overlap the territory of any other. The average number of people in each of the minor expeditions is eight, and each one is so organised as to contain a geologist, two topographers, a barometrical observer, two mule-packers, and a cook. Although each of the distinct divisions might lead the reader to suppose that the work is of the same general character throughout, it should be said that, primarily, the survey is divided into three grand divisions—north, middle, and south—of Colorado, each grand division embracing on the average 8000 square miles of territory to be surveyed topographically and geologically this season, besides making important collections in natural history, botany, and palæontology. Besides these divisions, Professor Hayden has wisely provided a photographic party under the command of an accomplished mountain artist, Mr. Jackson, who has already made over 2000 negatives of Yellowstone scenery, Indians, peaks, valleys, and natural wonders. Mr. J. T. Gardner, the geographer, with his own subdivision, carries on the primary triangulation from the summits of the loftiest peaks,

connecting the work of all other surveyors by accurate triangles, measured by a seven-inch theodolite. I am thoroughly acquainted with the *personnel* of the entire expedition, and although my journeyings have been confined to the operations of Dr. Hayden's party, I can say, without exaggeration, that no survey was ever organised in the United States combining so much experience and active professional talent, with a genuine taste for exploration. The topographers, geologists, and naturalists, with two exceptions, are graduates of the colleges and the first scientific schools, and all of them seem to have a special aptitude for mountain climbing, which, although not as severe as the ascent of the Matterhorn, is yet accompanied with great peril and fatigue, especially when the peaks jut up almost perpendicularly in columns of eroded granite.

"With Professor Hayden's party I left Denver on the 24th of July. His sub-expedition then moved along the base of the Great Colorado, or Firout Range, taking new altitudes, inspecting curious mineral deposits, and finishing the topographical work of 1873. Dr. Hayden developed a new feature in physical geography during this stage of the march, discovering the ancient shore line of the great inland ocean during the Triassic period—the upturned edges of the sedimentary rocks inclining from the eastern slope of the Rocky Mountains. On the 4th of August we passed through Burgen's Park, a stretch of beautiful undulating country thickly timbered, watered by cool streams, and supplied with an abundance of game and trout. Thence to Granite, the westernmost mining village of this region, we passed the well-stocked ranches of new settlers, who claim to be driving a thrifty business. Examinations of the previous work of Dr. Hayden and of his reports on this territory, convinced me that he has been a diligent and conscientious servant of accurate science. Passing Twin Lakes we moved into the unknown country, and for the last two weeks we have been exploring the Elk Mountains, a range richly stocked with elk, antelope, deer, and grizzly bear. The peaks range from 12,000 to 14,700 feet in height, being in most part granite and sedimentary rocks, thrust up by volcanic action, and perpetually covered with snow and ice. The scenery is coloral, embracing every variety of land and water-scape, from the genial Andean vistas to the grander Alpine views. On this the Pacific side of the Sawatch Range—the main divide between the Atlantic and Pacific waters—twelve new topographical stations have been fixed by Mr. Chillendar, and many peaks ascended, and splendid sketches, geological and otherwise, made by Mr. Holmes. It is probable that before the 1st of October over 100 new peaks will have been determined in altitude, topography, and geology. Mount Daly, named after Chief-Justice Daly, President of the American Geographical Society, rises 13,700 feet above the level of the sea, adjoining Capitol Peak. It is a noble mountain near the end of the Elk Range. Capitol Peak itself is 13,800 feet, Snow Mass 13,785, and Sofris 12,800; with many others as Pyramid, Gothic, Maroon, Castile, Italia, ranging from 12,000 to 13,500 feet. Before the expedition terminates its labours, over 25,000 square miles will be covered by its industrious scientists, and it is expected that the vast area of unknown drainage in Colorado will be thoroughly mapped. I wish I could give you more in detail the important results already obtained, but our movements are too rapid to permit me to write more at length at this time.

"ALVAN S. SOUTHWORTH."

THE VOYAGE OF THE 'CHALLENGER.'

V.

As with Marion Island and the Crozets, the discovery of Kerguelen Island is due to a Frenchman, Lieutenant Yves J. Kerguelen, who, in command of the French ships of war 'Fortune' and 'Gros Venture,' discovered it on the 13th of January 1772 (the same day that Marion discovered the island named after himself), and revisited it in the ships 'Rolland' and 'Oiseau' in 1773. In the first of these voyages Kerguelen made the two islands off the west coast, which were named after his ship, Fortune Islands; the main island was also seen, but the ships were so disabled by stress of weather, as to necessitate the commander to make the best of his way to Mauritius to repair damages.

As the object of his first voyage was to discover the great mass of land then supposed to be absolutely necessary to balance that known to exist around the Northern Pole, great importance was attached to this discovery, and a very inflated account of its nature went forth, which led to the second voyage. On the 14th of December Bligh's Cap, or, as it was called by the discoverer, Réunion Island was made, and landing was effected in Christmas Harbour, then called Bay de l'Oiseau, and afterwards in a bay on the south-west coast.

Owing to various circumstances, much confusion prevailed in the accounts published of these expeditions, and so little was known about it when Captain James Cook in his last voyage, already mentioned, visited the island in December 1776, that he named it, from its barren and desolate appearance, Desolation Island, by which name it is even now frequently known. Cook remained in Christmas Harbour four days, and two more were spent in delineating the east and south coasts.

Both Kerguelen and Cook agree in their accounts of the inclement weather prevalent at this island, and this in midsummer; for while the ships of the first named were disabled, Captain Cook experienced strong gales, producing a tremendous sea and seven days of nearly continuous fog; whilst from the boggy nature of the ground and the torrents that poured down every ravine, the rain must have been almost constant.

Kerguelen Island lies in much the same latitude in the southern hemisphere as England does in the northern, and even a little nearer the Equator, it being between 48½° and 50° south latitude, and between 68½° and 70½° east longitude. The island is about 90 miles long, and its greatest breadth about 45 miles; but some parts of the island are so narrow that the isthmus between the two coasts are called by the sealers *haulovers*, from the facility they give in getting from one coast to the other by hauling the boats across. There are a number of outlying islands off the coast.

In 1799 an intelligent master of a sealing vessel,

Mr. Robert Rhodes, commanding the 'Hillsborough,' remained several months at the island, and, in addition to the object of his voyage, made so good use of his time that he was enabled to trace much of the coast line; and although his work would scarcely bear a test in regard to accuracy, it was, nevertheless, considering the means at his command, an exceedingly creditable piece of work, and has, in fact, formed the groundwork of the larger portion of the island in the published charts to this day.

In 1840, Captain James Clark Ross, in the Magnetic Expedition, consisting of Her Majesty's ships 'Erebus' and 'Terror,' made Christmas Harbour his head-quarters for sixty-eight days; and although from its being in the depth of winter—June and July—extensive excursions could not be made for the examination of the coast, still we get a more perfect knowledge of the natural products, and a better description of the formation of the northern part of the island than from any other source.*

Christmas harbour is situated at the northern extremity of the island, the promontory of Cape Francois (the northern point of the island), forming one side of the harbour, which is open to the east. The south point of the harbour entrance is Arch Point and the well-known Arch Rock, a remarkable perpendicular basalt rock 150 feet high, standing detached from the cliff and having a well formed arch through it. Between the Arch Rock and Cape Francois the distance is nearly a mile, and from this line to the head of the harbour is $1\frac{3}{4}$ miles. On the south side a deep bay is formed between the Arch Rock and a point half the distance towards the head, and which point contracts the inner or upper harbour to about 800 yards. At the head of the harbour is a beach of fine dark sand, and on this beach Captain Ross had his observatory placed. On each side of the harbour hills rise to a considerable height; those to the south are very precipitous with a narrow beach covered with large stones and brown vegetation. Cook's view of the harbour is tolerably accurate. The upper bay is full of weed, *Fucus giganteus*. This remarkable plant is so thick that it is with the utmost difficulty that boats can be forced through; the pendant leaves from the pear-shaped bladders at the stem form an obstacle so dense that it is an obstruction, and the difficulty of keeping the oars from entangling in it prevents the power of the motive force from being of use, and an ordinary breeze acting against the boat will prevent progress altogether. A number of men from the 'Erebus' and 'Terror,' with sharp cutlasses fastened to boat-hook staves, were employed for days cutting a lane through this weed to enable the boats to have free access to the shore—a work of necessity with so much gear to land and such constant communication required. On the north side of the harbour near the head is a projecting little headland or cliff, to which the temporary name of *Cook's Wharf* was given; and here the armourers forges were established, and much work done during the stay of the vessels.

Notwithstanding the formidable look of the terraced hills they were by no means difficult of access, as here and there ravines had been made by the rushing water that enabled the perpendicular basaltic steps to be surmounted. The ascent to the black hill so conspicuous in Cook's view (called Mount Havergal by Captain Nares), was over a succession of flats and terraces. On approaching the black cliff, when about 400 feet above the sea, a quantity of fossil wood was found embedded in the rock, and so natural was its appearance that at first it was thought to be wood left by accident by whalers, or even Captain Cook himself. The ascent from there to the summit of the rock overlying this fossil bed is composed of a trap-conglomorate of great hardness. The trunks, which were numerous, were covered by a layer of shale, which probably protected them from being carbonized by the volcanic stream; some of them had much the appearance of recent wood, the bark and concentric layers being most evident, sometimes amounting to more than a hundred knots, and holes where branches had been broken off were also common. In some specimens the inner part of the wood was converted into a very hard, black, shining, crystalline mineral, some clefts or rifts in others containing small cinnamon-coloured crystals of transparent mineral. The most beautiful specimens were of a light gray colour with darker graining. The trunks lay packed together in beds of from 1 to 3 feet in thickness, some being many feet in length. A recent vein of lava having intersected the rock in one part also passed through the fossil wood, and the wood through which it passed was turned into a mineral resembling coal which does not burn.

The ascent from this to the summit of the rock was more difficult, there being much ice and snow. The mosses were beautiful. The top of the hill was flat, and a curious regular wall of trap-rock crossed the surface; it was straight, and from 2 to 4 feet high, broken here and there; it had evidently been left standing by the disintegration of the surrounding rock. Large and beautiful lichens were abundant; and many beautiful minerals were exposed by the continual fall of the cliffs, which laid open large cavities filled with crystal of cubicite, and also some very fine yellow ochre and cinnamon coloured masses of crystal.

The northern shore of the harbour is overlooked by a curious hill with a conical summit, which forms Cape Francois. The lower terraces of which it is composed consists of hard stratified basalt; the cone is also formed of hexagonal pillars, but they are broken up into angular fragments, or in some places bent and so tilted up that the bases of the prisms are exposed, forming small tesselated walls. The summit presents the appearance of a crater (which it undoubtedly is) bounded by an uneven ridge of loose stones, with a small shallow pool in the centre; the diameter of the summit is about 100 feet east and west and 50 feet across.

As the visit of the 'Challenger' to Kerguelen Island was partly due to the forthcoming transit of Venus, in obtaining information to help the astronomers, and as it was not known at what time the expedition for that island would leave England, a large cairn was built in which to deposit such information as could be collected for the purpose. No time was lost; surveying parties were organised, and

* Without trespassing on the domain of the published account of the voyage—*A Voyage of Discovery and Research in the Southern and Antarctic Regions*—the author is indebted to some notes from the private journals of the late Captain Alexander John Smith, R.N., and of Dr. J. D. Hooker (now President of the Royal Society), both of whom served in the expedition; he is also in possession of his own notes, made at the same time.

the staff of *philosophers* again roamed the island in every direction, not seeking so much "whom they may devour," as what they could bag for natural history specimens, although "the pot" was not altogether lost sight of, as twenty brace of wild ducks were shot, and bushels of the cabbages* gathered by the men.

The next morning the ship left Christmas Harbour proceeding to the south-east, making observations of the numerous bays and headlands on her way. Passing Howe's Foreland (of Cook), and keeping outside the vast beds of weed passed through by that navigator, in the evening anchored in Betsy Cove, Accessible Bay, a snug and safe anchorage, but small for a ship of the 'Challenger's' size, much used by sealers and whalers for boiling down their blubber at, and from which process they call it "Pot Harbour." There were evidences of the place having been used for the purpose, and in a number of graves and rude monuments, a sadder evidence of the hazardous life of those who pursue sealing and whaling as their calling.

The 'Challenger' remained a week in Betsy Cove, and the time was made the best use of when the weather allowed. Sights were obtained for rating the chronomoters, and the place surveyed. A number of sea elephants were taken, and one, 12 feet in length and 9 feet in girth, was dissected and headed up in casks, to reappear some day, probably in the new Natural History buildings now erecting in South Kensington.

Whilst lying in Betsy Cove they were surprised one evening by the arrrival of a schooner, of about 80 or 90 tons, the 'Emma Jane,' one of a small fleet belonging to an American whaling company. She reported that another of the Company's vessels, a barque named the 'Roman,' was in Accessible Bay. Two schooners are employed at Kerguelen Island, and one at Heard Island, in whaling and sealing, and the barque comes to the island in September, where she meets the two schooners, and the three proceed to Heard Island, and there remain during the sea elephant season, which lasts until the middle of December, and then return to Kerguelen, to fish for whales up to June. The barque takes the proceeds to the United States, returning again in September. The seamen are engaged for three years, and the barque brings a relief to a portion of them every year.

One of the most sad things connected with this sealing trade is the indiscriminate slaughter of the seals, old and young, for it is at the breeding season, when they land to breed and foster their young, that they are attacked; and although the large male seals are considered the best, as yielding most blubber, neither the clapmatches or the cubs are spared; and thus, like "killing the goose that laid the golden eggs," the seals are being gradually exterminated, and that, not from necessity or profit, but sheer wantonness and cruelty. Leaving Betsy Cove on the 16th the 'Challenger' encountered a heavy gale, and the next evening ran into Royal Sound, and anchored in Island Harbour; here they found the other schooner, the 'John Coalgate.'

Royal Sound is a magnificent bay on the south-east side of the island, running nearly 20 miles in from the sea. It is sheltered on the south by a range of mountains now called Wyville Thomson Range, with a fine volcanic peak rising as an enormous cone in the midst of a surrounding circlet of sugar-loaf peaks, to a height of 3160 feet above the level of the sea. To the west the towering snow-clad peak of Mount Ross, upwards of 6000 feet high, is seen rising in a continuous slope from the sea, and giving birth to numerous glaciers in the lower valleys. On the north is also the fine Crozier Range, 3250 feet high, named after Captain Francis R. M. Crozier, who commanded the second ship of Sir James Ross's expedition, and afterwards, in command of the same ship, perished in the ill-fated expedition of Sir John Franklin to the North Polar regions. "It is well and appropriately named," says one writer, "by Cook a *Royal* sound. He was always happy in his nomenclature of newly-discovered land, and probably when calling it 'Royal,' as being between the capes he named after the King (George) and the Prince of Wales (Prince of Wales Foreland), saw the fitness of the name in another sense."

There are hot springs at the sound on the low neck of land which forms the isthmus between Royal Sound and Swain Bay. The bay is studded with islands. Island Harbour, being formed by three of them, is a beautifully secluded land-locked spot, and much used by the whalers, as the presence of two huts and a number of barrels testified. There was also the same evidence of the precarious nature of the whale-fisher's life in about a dozen more of the same kind of memorial slabs as were found at Betsy Cove.

On the morning of the 19th the 'Challenger' steamed to the head of the sound, which is surrounded by high hills. A party landed and obtained fifty brace of ducks; and as the weather was favourable, surveying, dredging, and other collective operations were prosecuted with vigour, including the obtaining of several photographic negatives of the beautiful scenery. Proceeding from Royal Sound on the 21st, on rounding Cape George they were met by a westerly wind, misty weather, and a heavy swell, which caused them to turn back and seek an anchorage in Greenland Harbour, immediately east of the cape, an excellent harbour with westerly or northerly winds, but exposed to the south-east.

On the 22nd January the 'Challenger' left Greenland Harbour, and having reached almost the extreme south of the island, it was decided to return to the northward, and in doing so had a fine fair wind while passing up the east side of the island; but after passing Cape Sandwich had a dead beat to windward. The next day a heavy sea struck the ship and stove in one of the bow ports, at the same time washing away a part of the head and the foremost sounding platform.

On the 24th the weather moderated, and when the haze cleared, the high land of Mount Campbell was made. By the evening they were enabled to get into Cascade Harbour, where they anchored for the night; but instead of being able to proceed towards Christmas Harbour the next day it was as much as could be done to get into the safe anchorage of Betsy Cove.

January the 26th, the 'Challenger' left Betsy Cove and beat along the coast to the north-west against a strong head-wind, and anchored for the night under Howe Island, and the next morning, steaming through

* The seed of this plant has germinated in the Royal Gardens at Kew.

Aldrich Channel, got safely into Christmas Harbour. There surveying was resumed, and as much completed as time and weather would permit. Sights were obtained, and a notice of the proceedings of the ship, with remarks upon the weather experienced, for the information of the observers of the Transit of Venus, deposited in the cairn, on the north-east point of the harbour.

On the 31st Christmas Harbour was again left, and with a strong breeze the ship passed rapidly along the land, and succeeded in passing Cape George to the south point of the island, which was called Cape Challenger. During the afternoon the wind and sea increased too much to admit of getting into Swain Bay, without great loss of time and coal, so without delay they bade adieu to Kerguelen Island, and bore away for Heard Island.

Captain Nares, in giving names to the various islands, capes, mountains, &c., with a thoughtfulness that does him honour, did not overlook those that had preceded him in visiting Kerguelen Island, and the name of every officer that accompanied Sir James Ross in his voyage towards the South Pole will be found affixed to one portion or another of his survey.

On the 2nd February, being midway between Kerguelen and Heard Islands, sounding was had in 150 fathoms, and twice during the following night less than 100 fathoms was found, at other times finding no bottom in 220 and 425 fathoms, thus showing the irregularity of the ground. Light airs with thick fogs prevented the land being made until the morning of the 6th, when Meyer's Rock and McDonald Island were sighted, and soon after Heard Island was seen to the eastward. In the afternoon the 'Challenger' anchored in Corinthian Bay.

Some little confusion exists as to the first discoverer of this group of islands, for owing to the development of the theory of Great Circle sailing, by Captain Towson, in 1847, a number of vessels took the shorter route of a high southern latitude in passing from the Cape of Good Hope to Australia, instead of running round the globe in a parallel of latitude. In the years 1853 and 1854 various accounts were given of the discovery, but it is believed to be really due to Captain Heard, of the United States ship 'Oriental,' of Boston, who saw the group in November 1853, and two months afterwards, Captain McDonald, of the ship 'Samarang,' saw them, and they have since, very properly, retained the names of the two captains.

This group lies 240 miles from Kerguelen Island, or just below the 53rd degree of latitude, and between 72½° and 74° east longitude. McDonald Island, the westernmost, is a large block of barren rock only 1¼ mile long and half a mile broad; it rises 630 feet above the sea. To the north-west, at a distance of little more than a mile, is Meyer's Rock, rising precipitously to a height of 450 feet. Heard Island, 25 miles east (true) from McDonald Island, is 25 miles long and about 7 miles broad. Having no deep bays, it possesses no protection for ships in the usual westerly gales and swell of these latitudes. The mountains near the centre are said to rise about 6000 feet above the sea, and are covered with eternal ice and snow, from which two enormous glaciers extend, the spurs of which, even in summer, extend to the beach on the south side of the island, but do not reach the water on the north-east side except in Corinthian Bay.

As the 'Challenger' passed the north end of the island, Red Island, a round block of dark red lava, about 200 feet high, showed very conspicuously. It is readily distinguished by its colour, and lies half a mile from the shore of Heard Island; there is no passage between. A mile south of Red Island on the mainland is a high, square, black precipitous cliff, too steep for the snow to lie upon, and therefore always showing conspicuously. Soon after, the double peaked foreland, called by the sealers *Roger's Head*, opened out; it is 500 feet high and connected by a low neck. A square-topped black hill, about 400 feet high, called Saddle Peak, was seen appearing like an island. Each point of the coast is well marked by its black headland, and each bay or indentation by its one or more glaciers. The base of the one at the anchorage in Corinthian Bay, being exposed to the drifting black lava, is of a dirty light brown colour, the others a very beautiful transparent pale blue merging into white. On the sides of the hills separating the different ice streams, are ridges of black land formed into morasses by the *débris* carried down by the glaciers. The surface of the land near the north-east end of the island, must be very uneven as the glacier is very much broken, forming numerous crevasses.

Corinthian Bay lies immediately to the south-east of Roger's Head, and is readily distinguished by that headland. The squalls on rounding it were very violent off the land until the bay was opened, when the wind became steady, blowing from the westward across the isthmus. The 'Challenger' anchored in 10 fathoms water. On the west shore of the bay the land slopes down from the high peak of Roger's Head, wonderfully marked by its numerous thin layers of lava, overlying one another. Towards the head of the bay is a low level isthmus composed of washed up gravel and sand, which separates Corinthian Bay from Atlas Cove to the westward, and from the south-west bay on the opposite side of the island a passage for the sea had evidently once existed here. A line of low black lava cliffs, in the holes of which Cape pigeons build their nests, border the west shore of the bay and prevents landing. At the head of the bay is a low, black, sandy beach, on which the sea constantly breaks; but the sealers state that it is smooth enough to effect a landing on an average one day in three. The beach is so low that with a heavy sea it runs, breaking, some distance in shore at high water.

At the east end the beach is joined by the precipitous face of a glacier 50 or 60 feet high, which extends to Saddle Point, and prevents communication along the shore. But from Mechanics Bay to the south-eastward there is a track along the beach to the south point of the island, which allows communication without the necessity of crossing any of the glaciers.

The numerous streams from the foot of the melting glacier render the ground on the isthmus very boggy; they unite into a considerable stream, and enter the sea at the extreme west end of the beach, discolouring the water to a distance of a quarter of a mile, the muddy stream being distinctly seen in the blue sea water.

The mountain at the north-west end of the island has two peaks, both lower than the single peak in the middle of the island, which the sealers call Big Ben.

A party of sealers were found in Corinthian Bay, and another party was at the south point of the island, all

engaged in capturing sea elephants, the blubber of which is melted down, and the oil stored in casks, tanks, &c. The men at Corinthian Bay lived in two hermetically closed huts, sunk in the black lava ground, for warmth, and for protection against the strong westerly winds which blow with increased force between the two mountains as through a funnel. To visit them the party had to ford the stream, the water running over the tops of the knee-boots. These men work for the same owners as the whaling schooners seen at Kerguelen Island; they are left here in December, and return to Kerguelen the following August to meet the barque with stores from the United States. They appeared contented with their lot. The principal men are Americans; but some of the crew were Portuguese from the Azores and Cape Verde Islands. Their life is a hard one, and very monotonous, and not over lucrative, for they consider themselves fortunate if, at the end of their three years' term, they return home with 50*l.* in their pocket; and, as is too often the case with sailors, after their life of restraint, privation, and danger, they run into the opposite extreme of reckless unthrift and dissipation, so that at the end of the two months the ship is refitting, their money is gone, and being penniless, they return to those truly desolate regions for another term of banishment; but their exile being voluntary, they do not apparently seem to feel their complete isolation from the world.

Kerguelen Island and Heard Island appear to have totally different climates, and to be visited by different winds. Near Heard Island south-east winds were experienced, with thick fog for three days, and the sealers stated that it frequently blew from that quarter, which at Kerguelen from this direction is unknown; and from this circumstance, together with the testimony of the sealers to the inferior character of the weather at Heard Island, Captain Nares came to the conclusion that it was an unfavourable station for observing the transit of Venus, and recommended two positions being taken at Kerguelen Island, in preference to one party being detached at Heard Island. Like other places it occasionally has a period of fine weather, and the sealers agree that they get more in December than in any other month, when the northerly and easterly winds are not so prevalent as at other seasons, and that clear weather is often enjoyed for several days together. Should, however, it be decided that one of the astronomical stations should be at Heard Island, there is nothing to prevent a party being landed, but the ship could not remain to attend upon them. The best landing-place and also the best position for the station would be in Mechanics Bay, the indentation on the north-east coast, immediately south-east of Corinthian Bay.

The temperature, during the stay of the 'Challenger,' ranged between 39° and 36°, which was also the temperature of the surface-water; it may therefore be considered a correct indication of the mean for the time of the year.

The cabbage-plant of Kerguelen was also found at Heard Island, but of smaller growth. No ducks were found.

There is little or no kelp about the island: doubtless the great quantity of fresh water continuously running into the sea during the summer from the glaciers accounts for this.

Northward of the island 6 or 7 miles are two large rocks, called Sail Rock and Shag Rock. As far as could be ascertained through the mist, the latter was about 200 feet high, and a quarter of a mile in diameter, and Sail Rock a small pinnacle 50 feet high.

The sea elephants are found in considerable numbers, and afford constant employment for the party stationed here. One of the beaches on which these animals congregate cannot be approached by a boat, and if killed, the bodies cannot be removed by land. With a view of causing them to land and be killed on more eligible spots, the poor creatures are whipped into the sea again; but some of the oldest and largest are impervious to the whip, and will not move off to be killed in another place, even though the whip be turned into a club. These stubborn animals are known to the sealers as "beach roamers," and are left to their fate to die as they like.

Captain Nares intended remaining a day or two for the purpose of examining the island and fixing positions, but the barometer was falling so rapidly that it was not prudent to delay, and, on the morning of the 7th, put to sea. No sooner had the ship rounded the north end of the island, than a northerly gale broke on her with great fury. Knowing that the gale would be accompanied by thick weather, Captain Nares did not venture to pass to the eastward of the south-east point, as all the sealers were agreed in the information that a shoal spit extended from it many miles to sea. By midnight it was blowing a very hard gale, the ship under treble-reefed topsails and reefed courses, running fast to the southward; but the wind and sea increased so much that the ship was laid-to.

Early on the morning of the 8th of February a heavy sea struck the ship and stove in the two foremost ports on the main deck, floating everything out of the sick-bay; but beyond this no damage was done, and the day broke with decreasing wind and a bright, beautiful day.

The first Antarctic iceberg was met on the 11th of February in latitude 60° 52′. It was 200 feet high, and about 700 feet long. On the following day another was seen, and the ship's course altered to pass near it, this bringing all hands on deck to enjoy the novel and beautiful sight. The rich cobalt blue tints blending with the white of the ice, with the sea dashing against it, produced a fine bit of colouring. After this the icebergs became more numerous, and of course the novelty wore off. On this day they sounded in 1250 fathoms, and had a most satisfactory haul with trawl.

In a fog, during the night of the 18th, the ship ran into pack-ice, but fortunately the wind enabled her to force her way out again, and she *hove to* for the night. The next morning, in latitude 65° 42′ S., longitude 79° 49′ E., the ship was close to the edge of a dense pack, through which no lanes of water could be seen from the masthead: sounding was obtained in 1675 fathoms, and the dredge was hauled. The surroundings of the ship were now another novelty, creating great interest: on one side of the horizon a boundless field of ice and numerous icebergs about. The birds about the ship had changed except the Cape pigeon *(Pintado capensis)*; among the new ones were the beautiful little stormy petrel. The Cape pigeons were frequently observed roosting in the snow on the top of the icebergs.

The fine weather continued until the 16th, when the Antarctic circle was crossed in longitude 78° 22′ E.; the ship having followed the western edge of the pack to the southward for 150 miles, it now turned to the north-east.

The next two days the 'Challenger' pursued her way to the eastward towards "Wilkes's farthest," and the north end of the pack was rounded. On the 18th they experienced some heavy falls of snow, and at midnight the thermometer had fallen to 22°. The following day sounding was obtained in 1800 fathoms, and on the 20th no fewer than seventy-eight icebergs were seen from the deck. Much has been said of the necessity of our steam vessels, in making for the United States, taking frequent observations of the temperature of the surface-water in dark or thick weather and fogs, as a cautionary measure for prevention of accidents in running into or against icebergs; but it is extremely doubtful to what extent an iceberg will affect the temperature of the neighbouring sea, and unless such observations on the temperature are incessant, the ship, between taking one and another, might be lost. From the observations made in the 'Challenger,' they do not appear to affect the temperature of the water in their vicinity, but on approaching the pack, where the surface of the water was covered with ice for many miles, there was a sensible diminution in the temperature of the surface water, the difference being gradual as the pack is approached, to as much as five and six degrees.

On the 21st of February the day was very fine and calm; steam was got up, and the ship taken near a berg about 180 feet high. After photographing it, two shots were fired into it from the 12-pounder gun—the first, from a distance of about 30 yards, brought down a great quantity of ice in slabs; the other from a greater distance aimed at about a quarter the distance from the summit, buried itself in the ice. In the evening a fine aurora was seen, lighting up all the icebergs around. A course was shaped for Termination Land.

On the evening of the 23rd, in latitude 64° 18′ S., longitude 94° 47′ E., the pack was again met with. This position was 20 miles from "Termination Land," as depicted on the charts by Wilkes, who, although describing it as an appearance of land at a distance of 60 miles, did not note it in his chart as such, but inserted it as land; and as the 'Challenger' was so much nearer the assigned position, than the American discoverer, and with clear weather, it must be assumed that there is no land where he supposed it to be. It is much to be regretted that that officer did not on his chart content himself with recording the doubt expressed in his description.

The next day the wind increased considerably, with thick dirty weather, and so suddenly did this come on that, when in the act of lowering the dredge, operations had to be suspended and the dredge hove in again. The ship was taken up under the lee of an iceberg, and whilst in that position handing the fore-topsail, a sudden lull in the wind, or eddy current, occurred; the ship, gaining head-way, went bows on to the ice carrying away the jib-boom, dolphin-striker and starboard whisker, but without doing injury to the ship. By steaming astern it was cleared. Towards noon the wind had freshened to a hard gale from the southward with very heavy squalls and falls of snow, so thick indeed, that in no direction could the length of the ship be seen—a most anxious time, knowing that icebergs must be in the vicinity on every side. A good look-out was kept, and at 2.30 P.M., during the heaviest part of the gale, a large iceberg was seen looming through the mist directly to leeward. As the ship was drifting immediately upon it, and there being no room to steam ahead, by a manœuvre seldom practised in seamanship, the main-topsail was backed, and with the engines full speed astern, the ship fortunately gathered stern-way and just managed to clear it. Had it not been for the steam, it cannot be doubted that the ship and berg must have come into contact. After getting to leeward they endeavoured to use the iceberg as a breakwater; but the gale was blowing too hard for the ship to be brought head to wind, and she was obliged to be allowed to drift. In the evening the weather cleared slightly, and during a momentary lull, under the lee of another berg, the ship was brought round on the other tack. As the distance between the two bergs was now known to be clear, the night was spent in drifting backwards and forwards between them with a tolerable feeling of security.

The following morning the weather cleared up, and the pack being open the ship was run some distance within the edge to within about 15 miles of "Termination Land," and again, with clear weather, nothing was to be seen. At noon the edge of the pack turned to the eastward, and then with a fine southerly breeze the pack was soon left behind.

On the 26th, sounded in 1975 fathoms, the deepest water found since leaving the Cape: yellowish mud bottom, and then dredged again. The wind increased to a gale, and the same period of anxiety would have had to be passed, but for (this time) the friendly aid of a very large iceberg which enabled them, by means of steam, to susfain a position under its lee throughout the night. The next morning at daylight the 'Challenger' bore up for Australia before a strong, favouring gale, every one after the experience of but a few days heartily glad to be leaving a part fraught with so many dangers, and they could fully realize the feelings of the purser of the 'Vincennes', when asked by his commander to express his official opinion as to the expediency of continuing the exploration, he answered that he "could not understand the utility of proceeding when there was so great a probability of no one living to carry home the tale."

The last iceberg seen was on the 4th March, in lat. 53° 17′ S., long. 109° 23′ E. These icebergs of the southern regions—unlike those of the Arctic Seas, which present so many fantastic shapes, and which to a lively imagination represent ancient castles, cathedrals with cloistered aisles, churchyards, &c.—are very tame, nearly all presenting the same table-topped or twelfth-cake appearance, divested of all coloured ornaments. They are usually from a quarter to half a mile across, and 150 to 250 feet above water. As the temperature of both air and water in the southern seas, even in summer, is below the melting-point of fresh-water ice, of which the bergs are composed, it is evident that they can dissolve but very slowly.

Westward of longitude 80° E. but few icebergs were fallen in with, but to the eastward of 92° they were very numerous, and continued so to the eastward, even when at a distance from the pack. Their absence to the westward between 70° and 80° E. longitude,

except where close to the pack edge, was so marked, that coupled with their absence in the same meridians in lower latitudes, as exemplified by the ice-chart, which records all the positions in which icebergs have been seen, leads to the conclusion that there can be no land for a considerable distance to the south in those meridians, and that a high latitude could be attained in that direction, if desired.

The pack-ice found consisted of small salt-water ice-pieces that could not be called floes, from 30 to 50 feet in diameter. The single season's ice was about 3 feet in thickness, and the hummocky ice, formed by several layers heaped one upon another, and frozen compactly together, was from 7 to 8 feet thick, the upper surface of each piece being covered by a layer of snow about a foot thick. Scattered about in the pack were a few blue coloured bergs, pieces of all sizes being frozen into the salt-water ice. The latter was much honey-combed by melting, but of sufficient strength to be dangerous to a ship's side if brought in contact. A properly fortified ship would have made way through most of what was seen, but it certainly did not deserve the name of "barrier," given to it by "Wilkes."

When at the pack-edge the temperature of the water was always between 28° and 29°, just sufficiently warm to melt salt-water ice slowly, but to have no effect on the fresh-water berg pieces. At a short distance from the pack the surface water was 32°, but at a depth of 40 fathoms a temperature of 29° was always found; this continued to 300 fathoms, the depth to which the generality of the icebergs float, after which there is a stratum of slightly warmer water of 33° and 34°.

As the thermometers had to pass through these two belts of water before reaching the bottom, the indices registered those temperatures, and it was impossible to obtain the exact temperature of the bottom whilst near the ice.

Whilst in the neighbourhood of the ice, the temperature of the air ranged between 34.8° and 21.5°, the mean being 31.5°, a slightly colder climate at that time of the year, in an average latitude of 64° S., than is found in the month of August in the Arctic regions in latitude 74° N.

A great number of fin-backed whales were seen, but very few sperm whales. Strange to say, although Ross found seals and sea elephants in this and much higher latitudes, none were seen by the 'Challenger.'

On the 17th of March the 'Challenger' arrived at Melbourne, the voyagers glad once more to hear the cable rattling through the hawse-holes, and all well on board. At Melbourne they found the German training-frigate 'Arcona'; she also had, on her way from Europe, touched at Kerguelen Island, and anchored in Christmas Harbour, where they had discovered the cairn erected by the 'Challenger,' and had copied Captain Nares's instructions, re-depositing the document when they had done so.

It will be observed in these notes of the voyage of the 'Challenger,' that the author studiously abstains from advancing any abstract opinion of his own; he considers that he would not be justified in commenting too freely on the facts related, so as to in any way forestall or anticipate conclusions which it will be the duty of those who are bearing the "heat and burden of the day," to work out. J. E. DAVIS.

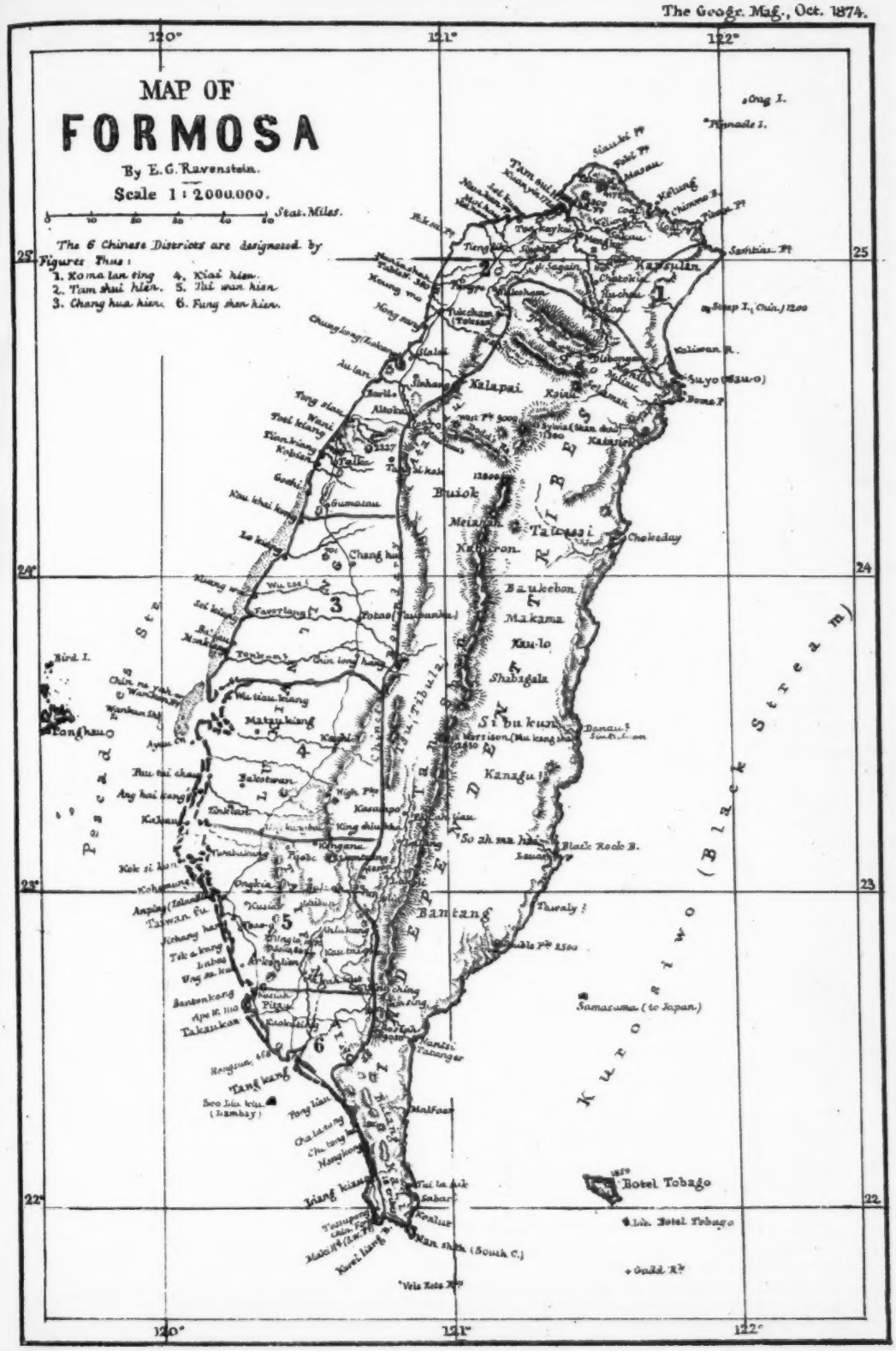
FORMOSA.

THE occupation of Southern Formosa by a Japanese military force has brought that island prominently before the public, and as handbooks and year-books devote but little space to an elucidation of its geography, our readers may be glad to have placed before them a somewhat more ample account, together with a map compiled from the best authorities.

Formosa—called Tai-wan by the Chinese, and Pak-an by its natives—lies off the coast of China, from which it is separated by the Formosa strait, a much frequented highroad for vessels proceeding to the ports of Northern China, and about 100 miles wide. Formosa, from Siauki Point, in latitude 25° 18½′ N., to the Nan Sha or South Cape, in latitude 21° 54½′ N., is 245 miles in length; its width varies, but nowhere exceeds 80 miles, and its area is 13,100 square statute miles. It is thus about half as large as Ireland, and somewhat larger than Sicily.

The Chinese must have known of the existence of this island at a very early date, though they only refer to it as the country of the Tung-fan, or Eastern barbarians during the reign of the dynasty of the Yuen (1278-1368). Subsequently it became known as Kelung, from one of the northern ports, which had received a colony. The Spanish discoverer, charmed with its luxuriant vegetation, bestowed upon it the name of "Formosa"—"the Beautiful," which it retains to the present day amongst the seafaring nations of Europe. The Spaniards built a fort on an island in Kelung harbours, the remains of which may still be traced. Their occupation, however, was of short duration. Their successors, the Dutch, established their factories on the west coast, and retained possession of the country for a space of thirty-seven years, from 1624-1662. The Chinese population, owing to the irruption of the Manju, increased considerably during that period, and the Dutch were finally compelled to relinquish this fine possession—much to the regret of their old historians. The Chinese immigrants at first governed themselves; but, in 1682, they submitted to the Court of Peking. Mandarins were sent, Taiwan-fu, the present capital, was founded, and the island placed under the Governor-General of Fukien, its chief magistrate being, however, permitted to report direct to Peking.

A chain of lofty mountains traverses the island from north to south, and divides it into two portions, having distinct physical features, that to the west being a low land, only rising occasionally into hills, that on the east being mountainous and difficult of access. The central mountain chain, called Ta-shan, or "big mountain," by the Chinese, attains its culminating point in Mount Morrison (Mu-kang-shan), which rises to an elevation of 12,850 feet, and is said to be covered with snow during the greater part of the year. There are other peaks not far inferior to it in height, and amongst these one of the most prominent is Mount Sylvia (Shan-chao-shan, 11,300 feet). The mountains are probably of volcanic origin, but sedimentary rocks, including slates, limestone, and sandstone, are also met with. Active volcanoes are not known to occur, though the existence of solfateras near Tamsuy, and the reported occurrence of submarine eruptions near the coast, seem to indicate that volcanic activity has not been long extinct. The


MAP OF
FORMOSA
By E. G. Ravenstein.
Scale 1 : 2000.000.
Stat. Miles.
The 6 Chinese Districts are designated by Figures Thus :
1. Koma lan ting
2. Tam shui hien.
3. Chang hua hien.
4. Kiai hien.
5. Thi wan hien.
6. Fung shan hien.
120°
121°
122°
25°
24°
23°
22°
Botel Tobago
Samasuma (to Japan.)
Black Rock B.
Vele Rete
Gulld. R.
Lib. Botel Tobago

"fires," however, which have been observed to rise from the ground in various parts of the island, are not ascribable to volcanic agency, but are due to the ignition of vapours arising from petroleum springs, or to burning coal-beds. The mountainous region extends down to the east coast, which, in many places, rises almost perpendicularly from the sea, and is covered almost throughout with most luxuriant primeval forests —the last refuge of the numerous small tribes who have not as yet submitted to the authority of the Chinese. The western half of the island presents an aspect altogether different. The trees have almost entirely disappeared. The wide plains and undulating hills are in a high state of cultivation, and maintain a teeming population. Numerous farms and villages, surrounded by groves of bamboo, bananas and areca palms, meet the eye; creaking bullock carts creep along the hedged-in roads; travellers are being conveyed in sedan-chairs, and the whole region is instinct with life and industry. A large portion of the plain has a sandy soil, and it is principally in the valleys, where a fertile mould covers the gravel, that the most abundant harvests are obtained. The clay and limestone hills frequently support only a scanty herbage, and it requires the perseverance of the hardy Hakkas (natives of Northern China) to cultivate them successfully. The west coast, though superior in that respect to the east, possesses only one harbour accessible to European vessels drawing more than 12 feet of water, and capable of affording shelter to a fleet. This harbour is formed by the estuary of the Tamsui River, and is accessible at high water to vessels drawing from 17 to 22 feet. It affords a safe anchorage during the greater part of the year. Only in early summer, when the melting of the snows and the fall of heavy rain convert the Tamsui River into a mighty stream rushing out with great impetus, are vessels occasionally driven from their anchorage. At all the other harbours along the coast larger vessels are obliged to anchor off the land, and to discharge cargo in boats, an operation frequently rendered difficult by heavy surf. Navigation is moreover impeded by sandbanks and reefs. From the south-west point, as far as Pong-liau, the hills approach close to the shore, and are backed by the wooded inland range. But from that town, past Takau and Taiwan-fu, and as far as Gochi, a distance of 160 miles, the shore is a sandy beach, or it is girded by lines of sandbanks, or rather islands, from a quarter of a mile to half a mile broad, and intersected at frequent intervals by shallow channels, the depth of which but rarely exceed 7 feet. These sandbanks are occupied by a few fishermen, whose huts and bamboo rafts are the only relieving feature of this dreary scene. Standing on one of these sandbanks no vegetation is in sight, and the mainland of Formosa can only be seen in clear weather. The whole of the immediate space seems to be an intricate mass of sand and mud banks, intersected by shallow channels, with occasional patches of sedge. Further to the north, hills of moderate elevation approach the coast, and on either side of the Tamsui Harbour these hills attain a height of 1720 and 2800 feet respectively, thus serving as capital landmarks. The northern extremity of the island is again low, and a reef extends from it for a considerable distance.

There are numerous rivers, but only one of them, the Tamsui (Tang-shui-khi) appears to be navigable for any considerable distance into the interior. Its navigation, however, is impeded by rapids, which are cleverly shot in Chinese "rapid" boats.

The climate of Formosa is described as pleasant and salubrious, and the heat is tempered by the proximity of the mountains and by sea breezes. At Tamsui, in the north, rain and clouds, brought by the north-easterly winds blowing over the warm Kurosiwo current, are the order of the day from the end of November to the beginning of May. At Takau the weather is most pleasant during the north-east monsoons (October to May), when the temperature rises but rarely above 92° Fahrenheit. In summer heavy rains fall near the coast only for a week or two, but a few miles inland it rains and thunders every afternoon from July to September.

The population of the island has been estimated at 3,000,000 souls, which would give 229 to the square mile. But as only about 6250 square miles of the island are in the possession of the Chinese, and the independent native population is not supposed to exceed 20,000 souls, the density in the Chinese portion would amount to 480, which far exceeds that of any European country of equal extent, and is surpassed only by five out of the eighteen provinces of China Proper. Taking all circumstances into consideration, and especially the absence of those colossal towns which swell the population of China and of our own manufacturing districts, we feel inclined to believe that the population of Formosa does not exceed a million and a half.

The population consists of three elements, viz., Chinese, tributary or "civilized" aborigines, and independent aborigines. Of these the Chinese, who have immigrated from nearly every province of the empire, occupy the foremost rank. They constitute the bulk of the town populations, and, aided by the subjected aborigines, they have brought under cultivation nearly one-half of the entire island. They are still extending themselves, and along the frontiers separating the immigrant from the aboriginal race constant warfare is the order of the day; the husbandman goes into the field armed, and the trader attends the place of barter attended by a body of matchlock'men. Hostile encounters, frequently brought about by the Chinese taking forcible possession of fertile valleys or camphor-yielding mountain tracks, are frequent, and generally attended with the loss of human life. Every Chinese frontier village is stated to lose in this manner from 50 to 100 heads every year, and even if the losses of the aborigines are less numerous, they must, owing to their numerical inferiority, finally lead to the extermination of the race.

The tributary aborigines (Pepo-hoans) either live amongst the Chinese or occupy entire districts in the interior of the country. They have adopted to some extent the dress and manners of the Chinese. They have given up tattooing, shave the head, and wear pigtails; but, together with some of the better qualities of their conquerors they have adopted some of their vices. Marriages between the two races are frequent. Most of the converts of the English Presbyterian Mission, established on the island in 1865, have been made amongst the Pepo-hoans. The missions connected with Takau and Taiwan-fu boasted, in the beginning of 1873, of 784 church members, and

of an average attendance of 1980 at the places of worship. No less than 282 adults and children were baptised in 1872, and the churches are partly maintained from the contributions of native members. In 1872 the Missionary Society extended its sphere of operations to Tamsui. In addition to this Protestant Mission there is one of Roman Catholics, conducted by Spanish Dominicans.

Before proceeding to give a description of the independent hill tribes, we will give a short account of the principal towns held by the Chinese, beginning near the southern extremity of the island, and gradually working our way up northward, along the coast. *Liang-Kiau* (Chiah-siang), the southernmost settlement of the Chinese (latitude 22° 5′ N.), is surrounded by a wall and a ditch, and has about 1000 inhabitants. The bay near which it is situated is open to westerly winds, but affords safe anchorage during the north-east monsoons. *Hong-kong* is a large Chinese village surrounded by wooded hills. Its inhabitants still pay a tribute to the savages for being allowed to cultivate their fields peaceably. Much fire-wood is brought to the place on bullock carts from the interior. *Tang-kang*, near the mouth of a considerable river, is said to have 20,000 inhabitants. *Takau* (latitude 22° 36′ N., longitude 120° 17′ E.) owes its importance to the fact of the harbour of Taiwan-fu not being accessible during the south-west monsoons. It is built at the entrance of a shallow lagoon, Ape-hill (1110 feet) constituting an excellent landmark; but apart from its increasing trade and the existence of a number of European houses, it is a place of no significance. The harbour may be entered by vessels drawing less than 12 feet: it affords safe anchorage, and might be converted into a capital port at a small expense. About 6 miles to the east of Takau, the road leading through a well cultivated plain, *Pitau*, the capital of the Fung-shan district, and a town of some importance, is reached. *Taiwan-fu* (latitude 22° 59′ N., longitude 120° 12′ W.), the capital of the island, is surrounded by a quadrangular battlemented wall, having a circumference of 6 miles. The houses of the mandarins, those of the principal citizens, and numerous temples, as well as extensive gardens and fields are enclosed by this wall. The streets are paved with brick, and the shops are well supplied. The population is variously estimated at 50,000, 70,000 or, 100,000 inhabitants, but the streets are silent, and in consequence of the gradual shoaling of the harbour its former prosperity appears to have departed from the place. When first founded the sea almost washed the walls of the town. It is now separated from it by a strip of sand, 2 miles wide, and the spacious harbour in which the invading Chinese anchored their fleet, can now be crossed without wetting a foot. The European custom house and a Chinese village, Anping-kong, are close to the old Dutch fort Zelandia, about 2 miles below the town. European vessels can only approach within 2 miles of the land, and are obliged to discharge their cargoes in boats. The anchorage, moreover, is safe only from December to March. The silversmiths of Taiwan are celebrated for their fine filigree work. *Kok-si-kong* (latitude 23° 5′ N.) is a small harbour, accessible to vessels drawing 12 feet. *Chang-hua-hien* (latitude 24° 2′ N.), a walled inland town of great importance, owes its prosperity to the vicinity of camphor-woods, the produce of which is exported in native junks through *Gochi*, a small seaport place in latitude 24° 16′ N. Tong-sian and Chung-kong (or Lo-kong), two small ports further north, likewise owe their importance to the export of camphor, which is procured at the foot of the hills, about 15 miles inland, where bituminous coal and petroleum are likewise found. *Hong-sang* (in latitude 24° 47′ N.) appears to be the port of the important city of *Tukcham* (Tek-san), which is the residence of many wealthy Chinese, and carries on a brisk trade in rice and corn. The harbour of *Tang-shui* or *Tam-sui* is open to European shipping, and its trade has increased lately to a great extent owing to the proximity of coal-mines, tea plantations, and camphor forests. The name of the small place where the European traders are located (latitude 25° 11′ N., longitude 121° 28′ E.), appears to be Hano-bai or Tang-fan-so (town of the eastern barbarians), Tang-shui merely applying to the port and river. About 10 miles above the harbour, the important town of Meng-ka (Banca) is reached. It lies in the midst of a well-cultivated plain, is supplied with good water from an aqueduct, constructed by the Chinese, in spite of the opposition of the savage natives, and numbers about 40,000 inhabitants. Most of the Chinese junks ascend to it to discharge their cargoes. Doubling the northern point of the island we reach *Kelung*, formerly called Peh-kiang, the northern port, in latitude 25° 9′ N., longitude 121° 48′ E. The town is walled, and numbers about 3000 inhabitants, who carry on a brisk trade in tea and coal. The harbour is extensive, but coral reefs abound, and the shelter is indifferent. Still further south is Sau-o (Su-yu), in latitude 24° 37′ N., longitude 121° 50′ E., the most southerly settlement on the east coast. It is a straggling town, with many brick houses and well-supplied shops. Its population is of a very mixed character, and is charged with being addicted to piracy. The harbour affords excellent shelter, even to large vessels.

We will now devote a few lines to the independent native tribes who occupy the whole of the mountain-region of Eastern Formosa:—

To the Chinese these savages are known as Chiu-hoan, raw savages—or Sang-fan, cannibals—an epithet, by the bye, which they do not appear to deserve. They are split up into a large number of tribes, numbering from fifty to a few hundred individuals each, and though constantly exposed to the encroachments of their western neighbours, the Chinese, they have not yet learnt that union gives strength, and the only confederacy known to exist among them is that of the Kalis, in Southern Formosa, where eighteen tribes, numbering altogether no more than 2500 souls, have voluntarily placed themselves under a common chieftain. The remaining tribes are almost constantly on the war trail, and when not engaged in raids upon Chinese territory they squabble amongst themselves.

In general features these natives bear a striking resemblance to the Malays. The many diversities observed amongst them, especially near the coast, where Mongol features are by no means rare, is easily explained by an infusion of Chinese blood. The similarity of language goes far to support this relationship, and the Abbé Favre, who has devoted some attention to this subject, is decidedly of opinion that the aborigines belong to the Polynesian race, that

they peopled Formosa at a period anterior to that when Buddhism was introduced into the Indian Archipelago, and that since that time they have had little or no communication with their ancestral home. It is remarkable, too, that seventeen of the tribes of Northern Formosa should designate their language as Tayal, which recalls the Tagal spoken by the Malays of the Philippines. The aboriginal inhabitant of Formosa is generally described as tall, well-made, and robust, and physically the superior of the Chinese. They are described, moreover, as being cheerful, good-natured and honest. Murder and adultery are said by Guérin to be almost unknown amongst them, and theft is exceedingly rare. It cannot be denied, at the same time, that shipwrecked mariners, who fall into their hands are frequently killed; yet Europeans who have visited them in their native forests have invariably been treated with kindness.

The dress of the men is limited sometimes to a strip of calico wrapped round the loins, but the use of sleeveless jackets has become general, and a sort of blouse, reaching down to the ankles, is worn during cold weather. The arms consist of a short sword, stuck in a girdle, a spear, and a bow or matchlock. The ammunition for the latter is carried in a bag suspended to a chain or a string of beads worn over the shoulder. A steel, flint and tinder complete the equipment. The women wear tight-fitting jackets and a skirt reaching to the knees, both of calico, and the latter ornamented with a bright border of red or yellow. The hair is bound up with red silk and then twisted round the head, so as to form a double coronet. Sometimes it is ornamented with leaves or flowers, Both sexes are fond of necklaces of beads and bracelets, and they insert a circular piece of wood, flat like a pawn or a shell, into the lower lobes of the ears. The custom of tattooing is universal amongst the tribes hostile to the Chinese. After a lad has accompanied a raid against the Chinese he is tattooed on the forehead, and when he adds the first head of a Chinaman to the trophies of his native village, he is tattooed on the chin. Girls are tattooed on the forehead, married women on cheeks and lips likewise.

The structure of the houses varies in different parts of the island, but nowhere is much consideration shown for comfort. The northern tribes live in small villages, in the midst of the primeval forests. Their houses are square, have a wooden frame and a bamboo roof thatched with straw. They have doors and windows. Bedsteads made of bamboo occupy the corners of the single room. The fire-place merely consists of three stones, and a bamboo rack is placed above it, where the skins and horns are hung up to dry. Arms and hunting gear ornament the walls. Opposite to the dwelling-house a store is erected on pillars, and, in addition to provisions, the entire wealth of the proprietor, including strings of small counters made of fish-bone, and used as money, is kept there. Sweet potatoes, hemp, and Arabia papyfera are cultivated near the dwellings, and cereals at some distance away from them. Near each village, but hidden in a thicket, may be seen a wooden scaffolding, where the skulls of Chinamen slain in battle are piled up as trophies. The Tsu, in the centre of the island, are said to live in circular huts. In the south a different kind of dwelling is met with. Each settlement generally consists of a long pent-house, built of mud-bricks and thatched. The interior of this long building is partitioned off into separate tenements, of a large and a small room each, and separated by bamboo walls, plastered with mud. Light is admitted only through the door, and the rooms are very low. Their furniture merely consists of a rough plank serving as the common sleeping-place; but sometimes tables and benches are to be seen. Stag's frontlets are attached to the white-washed walls, and matchlocks, bamboo-pipes, and other articles of common use, are suspended to them. The few household utensils, frequently limited to a few Chinese rice-bowls, are piled up in a corner of the room. Sometimes a bamboo-screen runs along the entire length of the house, reaching up to the projecting roof, and thus forming a covered passage.

The chief occupation of the men consists in hunting and fishing. The household duties, as well as a large share of the tilling of the ground, is left to the women. Rice and sweet potatoes, with venison and pork, constitute the principal articles of food. A fermented liquor, made of sweet potatoes, and called Sam-shu, constitutes a favourite beverage, and both sexes are addicted to smoking tobacco, and chewing betel-nuts.

Marriage takes place at an early age. Monogamy is the rule, only some of the chiefs having more than one wife. Amongst some of the tribes it is customary to break out two or even four front teeth, to celebrate the nuptials. The birth of a child and harvesting are seasons of high festival. On these occasions feasting and Sam-shu libations are the order of the day, two men sometimes drinking simultaneously out of the same cup. On these occasions a fire is lit in the open air, and, men and women joining hands, they dance around it to a plaintive song. At first the dancers step out slowly, but by degrees the speed increases, until it becomes furious.

There appears to be no belief in a supreme being or in a future state, but superstition, for all this, is ripe. The flight of birds is used as an augury, and genii are supposed to appear to persons during their sleep in the disguise of deceased relatives, to tender good advice. Thomson observed a stunted pole, with a jar of water placed in front of it, which he took for a household god, and when Swinhoe was offered a cup of Sam-shu, the women presenting it were apparently reciting an incantation. The dead, in the north, are buried in a sitting posture beneath the bed upon which they expire, and their clothing, ornaments, some rice and venison are buried with them.

The head of each family enjoys much authority, and each village has a head-man, chosen amongst the members of the same family for generations. The influence of this latter, however, is merely personal, and depends upon wealth and brute strength.

The natives are supplied by the Chinese with fire-arms, powder, lead, pans, jars, cotton-stuffs, beads, &c., and receive in return hemp, mats, rice-paper, skins, and horns of animals, as well as the right of cultivating the valleys and destroying the camphor forests. Too frequently, however, the encounters between the two nations are of a hostile nature.

Nature has been bountiful to Formosa with respect to her natural productions, and tropical plants, as well as many others of more temperate regions, attain there a high degree of perfection. Rice, as in China, constitutes the principal article of food, and from its

great productiveness, Formosa has been called the "granary of Fo-kien." There occur, however, years of drought (as in 1872), when rice has to be imported from the neighbouring mainland. Amongst other food-plants extensively cultivated, may be mentioned millet, maize, barley, wheat, sweet potatoes, and arum. Amongst fruits we may mention oranges, pine-apples, guavas, pomegranates, chestnuts, melons, and ok-que, a berry growing on a trailing vine, and converted into a jelly. Truffles abound in the forests; ginger, pepper, aloes, and ground-nuts, are obtained; jute and grass-cloth fibre (a species of hemp) form articles of export. The indigo of Formosa is famed for its bright and lasting tints, and manufactured grass-cloth is sent to the island to be dyed there. The cultivation of sugar-cane has assumed considerable dimensions, especially in the country around Taiwan-fu, where the art of refining the sugar is understood. No less than 123,823 tons of sugar were exported during 1869-72 in European vessels alone, or nearly 31,000 tons annually. The immense forests of the interior furnish timber of superior quality, and in a single timber-yard Swinhoe was able to collect forty-two different kinds of wood, which may now be seen at the Kew Museum. The tree most sought after is the gigantic *Laurus camphora*, which yields camphor, the manufacture of which frequently brings the Chinese into hostile collision with the aborigines, within whose territory alone this tree is to be found. Formerly the manufacture of camphor constituted a government monopoly, and its sale was farmed out to wealthy natives, who must have realised immense fortunes, for camphor, at the place of production, only cost $6 the pikul of 133 pounds, whilst at Hongkong it was sold for $28. The monopoly was abolished in 1868, but so many difficulties are placed in the way of the Chinese agents employed by the merchants as almost to be tantamount to a continuance of the monopoly. Mr. Colborne Baber estimates the quantity of camphor produced in the Tamsui district in 1872 at 13,200 pikuls, of which 10,281 pikuls were exported in foreign vessels; but this rate of production cannot be expected to continue for ever, as the old trees are being destroyed, and no young ones planted to take their place. Another product peculiar to Formosa is the so-called rice-paper, manufactured from the pith of the *Aralia papyrifera*, which grows wild in the hills. The pith is pared round and round with a sharp knife, the sheet is then moistened and flattened out, and cut into square pieces of suitable size. This paper is used in the manufacture of artificial flowers and for painting on.

The cultivation of the tea-plant has been introduced from China, and is rapidly on the increase, which is not to be wondered at, as an acre can be made to return 10*l.* without the cultivator being exposed to much risk. The country around Tamsui appears to be best adapted for growing tea, and the land is taken forcibly from the natives by the cultivators, who are supported by armed bands. The tea-brokers visit the various districts, and send their purchases down to Tamsui in "rapid" boats. In 1872 no less than 2,601,801 lbs. were exported in foreign vessels, or five times more than in 1868.

The domestic animals include oxen, horses, sheep, goats, pigs, and poultry. The oxen are used for riding, and by training them they learn to walk as fast as a horse. They also draw the cumbrous carts which bring the produce of the interior down to the coast. The prick-eared dogs of the natives are highly esteemed for hunting. Fish abound in the surrounding seas and in the rivers, and give remunerative employment to numerous fishermen, whose catamarans or rafts form a conspicuous feature along the coast. Amongst the wild animals there are wild hogs, deer, monkeys, pheasants and game in the western low lands, leopards, bears, wolves, and woodland birds in the mountain region. A venomous snake (python) is also occasionally met with.

The mineral riches of Formosa have hardly as yet been ascertained. Coal alone, and to some extent sulphur, are being explored, but copper and iron are said to exist likewise, and saltpetre has lately been discovered on the east coast. Coal has been discovered in several parts of the island, in the north near Kelung and along the Tamsui River, within 15 miles of the east coast, in latitude 24° 28′ N., and near Lakuli, in the south. The principal coal-fields, however, are those of Kelung and Tamsui, and they are being worked in a primitive style by Chinese, who live close to the pits in huts built of wood and straw. As many as 75,000 tons were raised in 1872, of which 40,231 tons were exported in foreign vessels. The supply, however, is capable of being increased considerably, if permission were to be given to open more pits and to introduce European machinery. The coal is a tertiary lignite, burns fast, and gives out much heat. It is excellent for household purposes, and fairly answers for steamers if mixed with some other kind. The price of coal at the pit's mouth varies from 13*s.* to 18*s.* per ton, according to quality, and a duty of 40 per cent. is levied upon it when exported. The necessity of supplying the Chinese navy with coal, and the high price of that article when imported from Europe, has lately attracted the attention of the Chinese authorities to Formosa, and this may ultimately lead to a great expansion of mining operations.

Sulphur deposits of great value exist in close proximity to the coal mines, between Kelung and Tamsui. Swinhoe, who visited one of these mines in 1857, thus describes it:—"Seen from a distance it appeared like a canker on the side of the grass-covered hill, which was fresh and green everywhere except in the immediate vicinity of the mine. The broad sulphur valley or chasm had everywhere a pale, sickly tint of yellow and red; and out of many of its numerous recesses hot steam gushed in jets with great force, like steam from an escape pipe of a high-pressure engine. In other spots small pools of sulphur were bubbling. At the bottom of the barren ravine rippled a foul rivulet, carrying off the sulphurous oozings from the ground. Within and round about this hollow the earth underfoot rumbled and groaned, and the air was so saturated with the exhalations of sulphur as to become extremely noisome and destructive to insect life especially, of which we saw abundant proof in the numerous remains of beetles and butterflies scattered around." The Chinese Government has forbidden the working of these mines, even going the length of compelling the local authorities to import the sulphur required for the manufacture of powder from Amoy. Yet, when Swinhoe visited the spot he found it alive with workmen, who melted the sulphur in stoves, and whose employers had no doubt found means to render

the mandarins blind to their proceedings. Up to the present time sulphur does not figure amongst the exports of the island.

Salt is obtained by evaporating sea-water, and forms an article of export. Petroleum, apparently of inferior quality, occurs at Tungshao, below Tamsui, and elsewhere.

The commerce of the island suffers from the absence of good harbours along the populous west coast, and of navigable rivers throughout the island, for even the river of Tamsui, which is the most considerable of all, is full of rapids, and can be navigated only by so-called "rapid" boats. Our information respecting exports and imports is limited to the harbours open to European commerce. These are Tamsui and its subsidiary port Kelung, in the north, and Taiwan-fu with Takau on the west coast. The value of the merchandise imported in foreign vessels at these places in 1870 to 1873 was as follows :—

	Taiwan-fu and Takau.		Tamsui and Kelung.	
	Imports.	Exports.	Imports.	Exports.
	£	£	£	£
1870	297,737	419,102	163,581	150,927
1871	364,421	396,888	225,512	165,817
1872	322,330	399,315	274,641	294,738
1873	308,614	305,595	—	—

This does not include the trade done by Chinese junks, which are able to penetrate into nearly every harbour of the island, nor does it include the import or export of treasure.

The following is a more detailed statement of the commercial movement in 1872. At Taiwan-fu and Takau, there was imported foreign produce to the value of 295,481*l.*, and Chinese produce to the value of 26,849*l.* Amongst the former, opium occupied the first rank, for no less than 2301 cwts. of that noxious drug, valued at 259,144*l.* were imported. Cotton piece goods (23,070 pieces, value 15,139*l.*) follow next. The exports amounted to 399,315*l.* and included sugar (748,597 cwts., value 379,891*l.*), turmeric (11,313 cwts., 6244*l.*), salt (39,341 cwt., 5963*l.*), ground-nut cakes and oil (11,441 cwts., 2338*l.*), longans (2687*l.*), sesamum seed, sharks' fins, camphor, &c. The imports at Tamsui and Kelung are of the same kind. They amounted in 1872 to 262,482*l.* for foreign, and 12,159*l.* for Chinese produce. Amongst the former there were 1667 cwts. of opium, valued at 216,363*l.*, 24,972 pieces of cotton goods valued at 17,946*l.*, and 3785 pieces of woollen goods valued at 12,920*l.* Amongst exports, tea (2,601,801 lbs., 216,440*l.*) holds the first rank; coal follows next (40,231 tons, 26,775*l.*), and then camphor (12,239 cwts., 23,633*l.*). The large increase in the export of tea, sugar, and coal, which has taken place during the last few years, and which has been attended by a corresponding increase in the import of British manufactured goods, augurs well for the future development of the Formosa trade.

In concluding this article it may be convenient to say a few words on the expedition directed against the island by the Government of Japan. Towards the close of 1871 a number of shipwrecked mariners from Liu-kiu, a group of islands belonging to Japan, were massacred in the South of Formosa. This, and other outrages, induced the Government of Japan to fit out a military expedition, which was placed under the command of General Saigo, and landed in May of the present year, in the neighbourhood of Liang-kiau, about 40 miles to the south of Ta-kau. The Chinese authorities offered no opposition to the landing of the troops, and their arrival was hailed with pleasure by the Chinese inhabitants of that part of the island, who looked upon them as welcome allies in their encounters with the natives. The Japanese have had several engagements with the natives, though not always, it would appear, with a decisive result, and their losses in the field were supplemented by others due to a malignant fever, which proved fatal in many cases. Whether this expedition originally took place with the consent of the Chinese Government or not, thus much appears certain that the latter is growing impatient at the protracted occupation of the southern part of Formosa. It is said that an arrangement has been arrived at in accordance with which the Japanese general will abstain from further hostilities, but choose his own time for evacuating the island. The Chinese are evidently actively engaged in the fitting out of a military expedition, but whether these preparations forebode a collision between the two most powerful empires of Eastern Asia, or some other event, the future alone can show.

E. G. Ravenstein.

IMPRESSIONS OF JAMAICA.

Chapter IV.—Faces at Blundle Hall.

Gayest of all the gay French bonnets, lightest and most voluminous of all the gauzy and silken *modes* assembled and met together in Kingston Parish Church on Sunday the 21st morning of that white hot month of January, 1866, were the bonnet and the dress of Miss Grant, sister of the excellent Mrs. Seacole, of Crimean popularity. To speak of Blundle Hall, and not to speak of Miss Grant, proprietress and tutelary genius thereof, is a piece of glaring reticence akin to mentioning Brighton Pavilion and at the same time ignoring George the Fourth. It would be like writing a treatise and leaving out the subject. Miss Grant was—we are talking in the past tense generally, but I am glad to know, on good and recent authority that there is a Miss Grant still, who moreover is still Miss Grant—was, and is, I say, a brown lady. She despised "niggers," and indignantly refused to entertain Soulougue, when that amiable ex-emperor fled from Hayti to Jamaica—he and his wife and daughter and Prime Minister, and maids of honour, and chamberlains and equerries, and "lords of the footman species," and all the coal-black court. I never knew a brown man or brown woman who did not with undisguised heartiness despise a "nigger." Nay, I scarcely ever met a nigger who, either directly or by implication, did not act on the pot-and-kettle principle of reviling his brother on the score of blackness. Before I had been a week in Jamaica, I had come to regard this very odd fellowship as a matter of course. Leaning out of my verandahed window at Blundle Hall, watching, as I often did watch, with mingled repugnance and admiration, the vultures sunning themselves on the shingled roofs of neighbouring houses, I heard a quarrel between two negresses, mother and daughter, in a small courtyard below. I think these women were of pure African race, whether creole or immigrant does not matter. They were disputing angrily the question of the

younger lady's propriety of conduct towards the opposite sex; and I was not a little amused at finding that the frail fair one frankly admitted certain lapses from virtue, but that she was incensed past all control of indignation by the charge of having committed herself with "niggers." She passionately defied her mother to prove that she had ever been guilty of the least flirtation with men of "a worse colour" than herself; and, with curious logic, she supported her negative by many affirmatives, declaring as a proof of her never having encourged the advances of Quashee or Quacco, that her list of lovers included many brown and several white gentlemen. Of these last she spoke with peculiar emphasis of pride in the familiarity which, as she confessed, or rather boasted, had sprung up between herself and them. The notion of a black sweetheart was violently repugnant to the chaste mind of a lady who had been honoured with the endearments of British and Yankee sailors, or perhaps even of a blond steward or supercargo.

It was, as I have casually observed, a time of rather doubtful issues, for Jamaicans and Jamaica, when I was forming these Impressions of the beautiful island. Though it is no part of my present purpose to rip up that much vexed question of rights and wrongs, in the suppression of a certainly serious outbreak, and in the punishment meted to those who were adjudged most culpable, I do not know that all reference or allusion to the people I met in connection with the now historical Inquiry is *taboo*. One of the English officers who had taken a prominent part in those affairs which led to the appointment of a Royal Commission was Colonel Hobbs, of the 6th Regiment; and of him it may be said, as of many more well-intending gentlemen who wore Her Majesty's uniform, in either service, that he was unfortunate in being his own historian. Poor Colonel Hobbs could not keep his hand from pen, ink, and paper. Those letters of his writing, which, together with certain other epistles yet more inflated and ill-advised, found their way into English and American newspapers, were stronger in self-accusation than any evidence substantially brought against him. One of the first faces I saw at worthy Miss Grant's boarding-house of Blundle Hall, was the face of Colonel Hobbs. Pale and wistful, with flashing, restless dark eyes; gentle and kindly mouth, courageous without firmness, the teeth showing prominently in front under the black, drooping moustache; nose slightly aquiline; the countenance of this unhappy, though once most fortunate and gallant man, was one I am not likely to forget. After his call on me, at Kingston, I had many opportunities of hearing from the lips of Colonel Hobbs, the story of his share in the grave responsibility of those events which had made the previous autumn of 1865 for ever memorable in Jamaica. I do not dwell upon the painful and much debated theme. All I care now to remember of poor Hobbs, with whom I was the last to speak, before his tragic farewell to the world and its troubles, was his happiness at home with wife and children, his love of gardening, and of making gardeners of his soldiers; his playful moods that flashed brightly out of melancholic gloom, his vivid, soldierly reminiscences of "battles, sieges, fortunes he had passed," what time his name was familiar as that of the youngest full colonel in the British army. He was the man who, standing on the quay at Balaclava, when the troop-horses were literally eating each other's tails off, or falling dead from famine, asked the honest captain of a transport that had lain in harbour for weeks without discharging her freight, the demurrage due to her being 60*l.* a day—"What cargo is there in that ship?" and received for answer the astonishing word "Hay." Colonel Hobbs was a religious enthusiast; some said "monomaniac," who, when he was not teaching his men horticulture, was making them sing hymns. He was a man of quick sensibility, very excitable, and liable to almost feminine emotions; and it is hardly wonderful that his mind should have given way under the pressure of anxiety which increased as the official inquiry at Spanish Town proceeded. Some days before it had concluded, Colonel Hobbs was in the care of trusty keepers, for the physicians had pronounced him insane. When the Commission of Inquiry into the conduct of Governor Eyre and his co-operators had finished its work, and a fortnight after Mr. Russell Gurney and Mr. Maule had departed for England, it was arranged that Colonel Hobbs and his family should make the voyage; and they embarked on board the 'Tyne' steamer for St. Thomas. Being one of the passengers, I was requested by a friend who had not had an opportunity of taking a personal farewell of Mrs. Hobbs, to deliver a letter of adieux to that lady, and on the second day of our passage, when I was thinking how I should find means to give her the note—for she had not left her cabin—Colonel Hobbs came on deck. He was looking much better than I had expected to see him look, and I congratulated him on returning health, telling him I was sure he only needed change of scene and a few weeks of repose to restore him thoroughly. "That is what you all say," he answered. "It is what we all think," said I, and I referred to Mr. Roundell, who had expressed the same hope and belief, in shaking hands with the invalid, but a few moments before. Colonel Hobbs, though very despondent, was quite calm in manner, and rational in speech. He talked of his disappointed hopes, and gloomily bade me remember always that he was "the most ill-used man in the British army." He had once been accounted the most fortunate! "Speaking as a dying man," was a phrase he used. I understood it as applying to his state of health, and had no idea that he contemplated suicide. Presently he turned to descend the stairs of the saloon, and I, hastily supposing that he would presently meet his wife, thought of the note, and asked him to give it into her hands. He took it with an absent look and manner, and, to my very great embarrassment, began opening it. Though I knew perfectly well that the contents were no more than half-a-dozen lines of friendly God-speed to the voyagers, I repented my haste, and would have given all I had to recal the note to my own possession. It was too late; nor was the matter of any real importance, though at the moment I felt it to be so. Colonel Hobbs, having read the letter without seeming to give it any attention, for he was still harping in broken sentences on his troubles and the supposed injuries he had received, vastly increased my perplexity and dismay by tearing the paper into little bits. Then, bidding me good-bye, and shaking hands, as he repeated the injunction that I should never forget how wronged a man he had been, he went down a stair or two, but returned, to pick up the

torn pieces of the note, and drop them coolly over the side. Then, without another word, he descended to his cabin on the lower deck. In less than a minute I heard the cry of "man overboard." The alarm was taken up from mouth to mouth; but strangely enough I never thought of Colonel Hobbs, till, looking aft, in the white wake of the steamer, and in the gleaming sunshine, I saw the pale face and black hair and beard of him who had too surely spoken to me "as a dying man." A boat was lowered, Mr. Stephen Dix, first officer of the 'Tyne,' taking command in what was a forlorn hope indeed; and for some time the men rowed backwards and forwards over the spot where the poor fellow had gone down. He had struck out with the instinct of a good swimmer—there were few better than he, as I knew well—but his mortal determination came back upon him with renewed force, as soon as he saw the boat manned to save him, and he sank like a plummet.

I have retold, in this short digression, the story which I bore sadly to England eight years ago; and I believe this is the first time I have publicly mentioned the little incident of the torn letter. It was agreed at the time, between the medical attendant and myself, that we should do best in keeping silence for a while on a subject that could but needlessly burthen a tragic narrative with a few sad details. Let me now ask my readers to accompany me back to Blundle Hall, where, in the early days of my visit to Jamaica, I met some old friends and made two or three new ones. Miss Grant's *clientèle* was largely augmented by naval officers, from any ship or ships that happened to be on the station: and, besides the flag-ship of Admiral Hope, the 'Aurora' frigate was in Kingston Harbour, much to my delight when I came thither. With the old ship I had a pleasant intimacy of long standing; and, though she had changed command since I first sailed on board her as the guest of Sir Leopold Mc Clintock, then her captain, nearly all the officers with whom I had cruised so merrily in the Baltic and North Sea were with her still; and as for Sir Leopold himself he was, as I have said in a previous chapter, commodore of the station. We had amateur theatricals during the stay of the 'Aurora' at Kingston! and the theatre in the great sandy desert of a square at the top of the town was crowded with brilliant but perspiring audiences, with whom Mr. Patrick F. Keelan, the surgeon, one of the best stage Irishmen since Power, was an especial favourite. "The world is so small" that travellers meet everywhere on its surface, with the most surprising frequency. Not only did I foregather unexpectedly with messmates whom I had last beheld in high latitudes, but almost every second man I met on the island was related in some manner to somebody living next door to me at home, or else over the way. The Postmaster-General was the uncle of some prosperous young London citizens of my acquaintance; and the likeness to his relations, both in features and voice, was so striking that I knew him instantly, before I heard his name or had been told that he was in Jamaica.

One morning as we sat at the breakfast-table in the front gallery of Blundle Hall, enjoying the sea-breeze, the cassava cakes, and the other delicacies proper to that early time of day, a notable addition was made to the pretty numerous body of Miss Grant's customers. Of three young gentlemen who entered the tavern or boarding-house together, one especially claimed attention by his unmistakeable look of *caste;* by which word I mean, not as is too frequently and very erroneously meant, rank or station, but race. No one could have failed to identify him as a son of the Duke of Argyll; and indeed he was the Marquis of Lorne, then about a year short of his majority, and travelling, as the heir to an English or Scottish Dukedom should travel, beyond the influences of European conventionality. With Lord Lorne were his cousin Mr. Callender, in whom I recognised one of the midshipmen on board Sir James Hope's ship; and the Honourable Henry Strutt, Lord Belper's eldest son. It was not long before, having twice or thrice met the same party at the house of General O'Connor, the Commander-in-Chief, and elsewhere, I stayed with them for a few days under the roof of Mr. Harrison, a planter in St. Thomas-in-the-East, and accompanied them round the district in which the disturbances had broken out, and to which they were chiefly confined.

Godfrey Turner.

(To be continued.)

Progress of Indian Gazetteers.

The Gazetteers at present being prepared under the superintendence of Dr. Hunter in different provinces and presidencies of India, are in various stages of progress, but they may all be expected to be completed within two and a half years from the present date. The only exceptions are Bengal (including Assam) where the great size of the province, and the absence of settlement officers, makes the work fall heavily on the provincial editor. The time which it will take will probably be from three to four years. With regard to the others, those for the Central Provinces and Berars were published in 1870; those for the North-Western Provinces, the Panjab, Oudh and Mysore are in a forward state, some of the districts being already printed. In Bombay operations were commenced on a local plan, but having failed, they have been recommenced on the new system, and three districts will probably be ready for press by the end of 1874. In Madras, manuals of the seventeen districts are being prepared on a large scale by district officers, and four are published, the rest being in a forward state. Operations were reported as having commenced in British Burmah in 1867, and in 1870 the result made its appearance in a pamphlet in which seventeen pages were devoted to a description of the country, and seventy-two to lists of native kings. Captain Shearman is now at work collecting materials on a proper system. In the Native States the collection of statistics is so dependent on political considerations, that no regular progress can be predicted. Still some results are available. A concise gazetteer of Karauli, by Captain Powlett, has appeared, as well as an account of Manipur, by Dr. Brown, Political Agent, and one of Nepal, by Dr. Wright, some time acting Resident at that State.

The lists of places showing the recognized spelling to be adopted in gazetteers and other publications are urgently required both in India and England. They are now in a forward state, and we may accordingly soon look for some approach to uniformity in the spelling of Indian geographical names.

Reviews.

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TELEGRAPH AND TRAVEL.*

THE title of this work implies a twofold character. But, in fact, the book, like British India and Omnis Gallia, is tripartite. The author himself, in a happy motto from Thackeray prefixed to Part II. (really Part III.), suggests a comparison with a charade; and if we follow out the suggestion, we may say his first is a biography, his second is a history, and his third is a collection of diaries. What his whole is remains to be considered. In doing this we shall treat the work in Oriental fashion, and begin at the end, *i.e.* with "Travel."

What an amount of toil the author has undergone, in working towards the important end of the stable telegraphic connection of India with England, may be judged from a fact which is nowhere stated by him, but which we have calculated upon the map prefixed to the title page.† This is, that his travels—land travels alone, and *in Persia and Bilúchistán alone*—with the addition merely of the short links needful to bind them to Baghdad on one side and Karáchi on the other, measured with a 50-mile opening of the compasses, and therefore far beneath the truth, amount to 5700 miles. The true distance cannot have been less than 7000 miles. We can understand the satisfaction with which Colonel Goldsmid, in 1869, by accomplishing the short journey of 110 miles between Gwádar and Charbar, on the Mekran coast, put in the only missing link in the achievement of the true overland journey between Karáchi and the Caspian.

The travel portion consists, in large part, of extracts from diaries, and in smaller part (but larger type) of pages of more condensed and digested material. On the whole we find the latter preferable, and could have wished the proportions reversed. Interesting notices and just observations will, however, be found scattered plentifully throughout the pages of both sorts.

Indian service always tends to develop idiosyncrasies: we generally expect them in a brother Anglo-Indian; and how much of our pleasure in retrospect, and in meeting old friends, is connected with these idiosyncrasies! One of Colonel Goldsmid's appears to be a love of tantalizing allusions and teasing initials. In the city where we are writing, when an editor reports offences against person or property, he is never so indelicate as to mention names. It is A. B. who sticks C. D. under the ribs, and E. F. who is arrested for firing a revolver "at lairge" (as one of Dean Ramsay's heroes would have said) in the streets of the city. Sir Frederic has a like practice. In ascending the Tigris, Captain S. is on the watch; Lieutenant B. goes after the wild hog; the party is swelled by the arrival of Colonel S., Lieutenant C., and Sir C. B. We may generally ascertain by some turning of pages to whom these initials belong, but when we are told that "Chevalier Romulus B. started for Tehran," we are justified in feeling aggrieved that we have no means of learning whether this worthy knight's cognomen bore any correspondence to his remarkable prænomen. When again we read that

> "Old Q. dines with us, and is evidently happy. His black costume, hanging coat, and quasi knickerbocker trousers; his nut-cracker nose and chin, and thin visage; his gait and attitude; above all the sinister facial expression give him the look of a second class Mephistophiles,"

who can help a suspicion that old Q. is an evasive euphony for "Old N.?"

Why should we be told of the Pasha of Sivas's strong resemblance to "one of our best known modern Indian heroes?" Are they (of all men on earth) all cut on one pattern? That teazes some readers as a bone in one's throat does. And when the author pays a tribute to one now departed, "who, whether discharging his official duties in Northern Persia, or on the shores of the Black Sea, could shed the light of his modest labours even upon Western Europe, and make his allotted corner, however remote, a centre of general and extensive usefulness"—why should nine-tenths of the author's readers be left in ignorance of the respected name of Mr. Keith Abbott?

Our excellent traveller and telegrapher (we ought to say T. and T.) is by no means unconscious of his own indulgence of this odd fancy. He alludes (p. 568) to having once spent a Christmas at Hūki, which place, he says, "I leave to be discovered on the map!" Now this shows the animus of the man, bent on setting his reader perpetual conundrums! The best map on which to look for Hooky is evidently that excellent one of Walker's; yet even on that we fear it will be sought in vain!

When we give utterance to irrepressible remonstrance against a scholar and a traveller like Colonel Goldsmid giving countenance, more than once, to the false spelling of London shop-windows, "solar topee,"* we have done with our presumptuous criticism, and will now Bee-like—perhaps we should say "B.-like"—seek here and there to extract food and flavour from "Travel."

Let us first take a pleasant sketch of Muhammad Ismail Khan, bearing the style of Wakíl-ul-Mulk, minister of the Prince nominally governing Kerman, and himself afterwards governor of that province:—

> "January 13.—Call on the Wakíl-ul-Mulk. . . . . our interview lasting an hour or more. He is short, very stout, has a large nose, and generally prominent features, with an eye sufficiently sharp to make itself appreciated through a pair of monster spectacles, which impart no little character to the portrait. He was dressed in a very clean and neat Persian costume, wearing a drab coat of beautifully fine texture, and red nether garments like those of the Indian Parsis. He received us with a brisk cordiality for which I was hardly prepared; and we had scarcely sat down at his invitation when he poured out a volley of compliments, and pleasant preambles to conversation, such as I had been little used to hear even from his talkative coun-

* *Telegraph and Travel, &c.* By Colonel Sir Frederic John Goldsmid, C.B., K.C.S.I., late Chief Director of the Government Indo-European Telegraph, &c. With maps and numerous illustrations. Macmillan & Co. 1874. 8vo., pp. xiv—673.

† This is an adapted map, and scarcely a satisfactory one. The author's routes are not correctly traced in it (compare that from Kerman to Charbar), and the nomenclature is discrepant. The Gwādar and Charbar of the book appear in the map as Gwetter and Choubar; Bampūr appears as Bunpore; Bamm and Kūm as Bumm and Kum, a pair which cannot both be right on any principle. Sir F. Goldsmid has probably not taken sufficient note of this map's peculiarities, before sanctioning its adoption.

* *Shola* (Hindustani) or, by the Bengali incompetence for the Shibboleth, *Sola*, is the vernacular name of the plant *Aeschynomene paludosa*, which gives the pith whereof such *topees* are made.

trymen. The English were his *beau-ideal* of strangers; 'he had known them,' he said, 'from childhood; his father had been Sir John Malcolm's Mihmandar.' There never was such a man as Malcolm Sahib. Not only was he generous on the part of his government, but with his own money also. . . . . From this and Central Asian politics he came to the object of our journey, and here some difficulties presented themselves to his mind. Evidently he did not care to have the telegraph at his head-quarters; he suggested that a better road might be found for it from Yezd to the sea-coast than through Karman [shrewd Vicar of the State !]. . . . . Every now and then our energetic host would rise from his seat and *more suo* not *more Persico*, bustle about the room. He had things to show us, and not caring to have servants always about him, he fetched his own boxes, opened them with his own hand, stooped to pick up any fallen article—in short, proved himself a most agreeable rarity. . . . . Just as he could turn in an instant from personal cares to the details of provincial administration, so was he always ready to give attention to the cases and claims of individuals. He had the character of knowing the history of every resident in Karman, and, judging from ourselves, he took little time in learning the wants of strangers. . . . . I wished him to name some article of English or Indian manufacture he would allow me to forward from Bombay, as the merest souvenir of a short but pleasant acquaintance. Reiterating an assertion that he needed nothing but reciprocity of kindly feelings, he said, if I insisted on sending something, let it be a translation of the *History of Persia*, which he had understood the friend of his boyhood, Sir John Malcolm, had written. On his part he would give me a written account of Karman.* Like all his countrymen he had quaint superstitious notions. One was that, until arrived at forty, no man's judgment was to be trusted. . . . . Another was the infallibility of '*Mūmia*,' a kind of resin exuding from rock, to serve as a cure and prophylactic in physical emergencies . . . . In bidding us farewell, which he did in evident sincerity, the khan commended us to the protection of the Universal Father—of Him who is omnipotent without respect of places or persons."

A tiny box of the precious *mummy* was bestowed on Colonel Goldsmid, with a detail of the many virtues which it exercised alike on *morale* and *physique*, but without instructions whether the application was to be external or internal. We know, however, from the very curious account of *mumia* in Kämpfer's *Amœnitates Exoticæ*, that it was used in both ways.

It is a little the fashion now-a-days to disparage Sir John Malcolm, and M. de Khanikoff includes him in his somewhat wholesale depreciation of British travellers in Persia. Whilst we have such representatives in Persia as the telegraph officers have been, from Colonel Stewart downwards (we speak of *them* because we know what they are), we need not much mind such depreciation. But returning to Malcolm, that must have been a rare *Firinghi* who, by sight or hearsay, left such an impression on a whole Asiatic nation as has scarcely been left since the days of *Malik Rik;* he must have been no common *man*, who won such strong regard at once from Richard and from Arthur Wellesley, from Ismail Khan, and from Julius Hare.†

* A note informs us that both promises were kept; but the Malcolm was only completed after the khan's death, and was delivered to his son and successor.

† Hare calls Malcolm (see *Guesses at Truth*, pp. 216-219) "him, who among all the persons I have converst with to the edification of my understanding, had the keenest practical insight into human nature, and best knew the art of controlling and governing men, and winning them over to their good;"—and again—"the illustrious friend who was always so kind, always so generous, always so indulgent to the weaknesses of others, whilst he was always endeavouring to make them better than they were—he who was unwearied in acts of benevolence, ever aiming at the greatest, but never thinking the least beneath his notice—who could descend, without feeling that he sank from the command of armies and the government of an empire, to become a peace-maker in village brawls—he in whom dignity was so gentle, and wisdom so playful, and whose laurelled head was girt with a chaplet of all the domestic affections—the soldier, statesman, patriot, Sir John Malcolm."

At Mosul (p. 422), we read :—

"Went into the Church of the Miskinta (probably Arabic 'Miskīnah') who, the Syrian Bishop explained to me, was supposed to be the poor widow of St. Luke, xxi. 2;* also believed, as I understood, to be a martyr. Her tomb is exhibited."

This is a very curious and to us new example of the singular custom of individualizing anonymous characters in the Gospel history, or even parables, which has identified a House of *Dives*, still shown, we believe, at Jerusalem, and which in former days erected in Galilee a monastery dedicated to *Saint Architriclinus*, viz., to the 'Αρχιτρίκλινος or "Ruler of the Feast," at which the miracle of Cana was wrought (St. John ii. 9).

At Kazan (p. 508)—

"Visited the printing-office, a place of considerable attraction to me since buying a Koran printed there, from a Tartar in the Crimea, shortly before the close of the campaign in 1855-56. Here I found the whole establishment Russian, though Tartar workmen are employed in *setting up* the Arabic and Turkish types. What would have been said of the Honourable East India Company, had *they* printed and sold the Koran to the money profit of the State! The type is excellent, and the carefully punctuated volume would supply an infinite number of valuable readings to the Arabic student: but what Propaganda would sanction the principle involved in the result?"

Either the timber on the shores of the Caspian must be of the shortest, or the ideas of the Russians on those shores regarding proportion in domestic architecture must be peculiar. At Enzeli, on the southern coast, our traveller was most hospitably received (p. 532) by "the Russian Consul, Mr. P.," and accommodated in his traveller's room, "an apartment about 14 feet by 6, with pictures of flowers and females." But this is nothing to Astrakhan. There his room was "really a good room of its kind, 17 feet by 3, and about 18 feet high, with a well-boarded floor of good polish-taking wood; and it has two fine large windows. Furniture—sofa with dark glazed cover . . . five chairs, and two small tables . . . a looking-glass, a suspended double lamp, and . . . brass fixtures for a stove and lights." If there be no error of the press here, this too well furnished chamber must have been something like the garden of Dr. Hahnemann. A visitor who found him in it remarked on its very restricted width: "*Ja freilich*," said the Father of Infinitesimals, pointing to the heavens, "*aber es ist unendlich hoch!*"—narrow it is, but the height is infinite!

Sir Frederic, writing (it is fair to say) in 1864, makes these remarks :—

"I feel quite sure that the Electric Telegraph in Turkey is abused by those who have the power of abusing it, inasmuch as a vast number of telegrams on the public service are intercommunicated without the faintest occasion, and for the mere sake of gratifying vanity, or the whims of members of the administration. This entails much extra labour which could be avoided, and converts a valuable state engine into a plaything."

This surely was natural enough, considering the premature association of Turks and Telegraphs for the convenience of Christian allies. But if Sir Frederic will look up some of the reports on the expenses of mail-carriage and the abuses of franking, that were obtained under the stimulation of Sir Rowland Hill, previous to

* Also of St. Mark, xii. 41. *Miskīn* means indigent; Miskīnah or *Miskīnat*, a poor woman. And hence Italian *Meschino*.

the great Postage Reform, he will find record of analogous abuses in England on a much vaster scale and with much less apology.

The second section of the work, which we have characterised as history, is a condensation of many official reports and many personal recollections; and even the analysis of it would require more space than these columns can afford.

This part of the work in some respects bears an analogy to Mr. Markham's *History of the Indian Surveys*, and among its valuable attributes we give no low place to the fact that it follows the example first prominently set in that official publication, of preserving a detailed commemoration of those who rendered good service in a great civil enterprise. Nothing in this creditable book is more conspicuous than the author's generous appreciation of those who have worked with him, from his deputy down to the sapper-corporals; and in their favour even his love of initials is overcome. To one alone of those who bore the burden and heat of these labours no justice is done here; and hardly even an initial is spared for Colonel G.!

We think it is perhaps a pity that Sir Frederic did not add a few pages on the history of the Red Sea cables. Allusions to those other costly strings to our telegraphic bow necessarily come in; and these need some elucidation, whilst the addition would also have rendered the record a complete one of an important episode in the history of British rule in India.

Though the body of the work is divided according to its title, there is necessarily some "Telegraph" in "Travel," and a good deal of "Travel" in "Telegraph." Take the following as an example of what telegraph officers had to do in the way of travel:—

"Lieutenant Champain left London for Persia *vid* the Danube and Tiflis, on the 12th September (1863); found two of his most active assistants, Messrs. Hoelzer and Walton, hard at work at Tehran on arrival there, the 20th October; quitted Tehran the 3rd November; and riding post the greater part of the way, reached Bushahr on the 17th *id.* Here he met Captain Murdock Smith and the non-commissioned officers of R.E., with whom he returned to the capital, leaving Bushahr on the 7th December, and reaching Tehran on the 28th January, 1864. Those . . . . knowing something of the kind of country to be traversed, and means of traversing it . . . . will acknowledge that this was rather severe travelling; and the more so when a journey from Tehran to Baghdad, Baghdad to Alexandretta (*vid* Aleppo), and Alexandretta to London, had been performed by the same officer in the previous year; and a tour of inspection from Tehran to Baghdad, thence to Bushahr and back to Tehran, added to a further journey from Tehran to Baghdad, and Baghdad to Samsun, Constantinople and London, were to mark for him the first half of the years 1864 and 1865 respectively" (p. 221).

And the next quotations will illustrate the sort of refreshment that occupied the intervals between these journeys:—

"The Governor of Bushahr had assisted Lieutenant St. John, but as soon as the line had passed through his territory into that of the Governor of Shiraz. . . . the labourers, no longer paid or fed, rapidly deserted; no representations to the Governor of Shiraz had any effect, and when the directors came up with the working party he found that it only numbered ten men out of sixty at first engaged. At Shiraz he tried three times to see the governor, but was always refused admittance" (p. 225). Again, in the district in which the capital itself was included—"all this time the most stringent orders had been continually sent by the Persian ministers and the Shah himself to the Governor of Tehran, who for three months would take no notice whatever of the *firmans*. An officer of the king's was quartered in the governor's house to insure obedience, but without effect . . . . Nothing would induce the Persian authorities at Tehran to give us either mules or men for the work" (p. 227). Justly did Major Champain on reporting completion of the first wire of communication, pronounce the conduct of the officers and men to have been "admirable," adding that it was "to their intense perseverance and patience, notwithstanding the most harassing and vexatious treatment" that he attributed success, so far as it had been obtained (p. 228).

If the remonstrances of the British officers had little effect, it cannot however be said that their recommendations carried no weight. One of the Persian assistants had displayed conspicuous energy and activity. The speedy completion of one part of the line was considered due "to his unwearied efforts." And a hope was expressed that "his services might be brought to the notice of the Government of his Majesty the Shah." And the author has learned accordingly that this unfortunate gentleman was turned out of the Persian service, *receiving a severe bastinado*, shortly after his return to Tehran! "The pretext for such treatment was peculation, of which he was assuredly guilty, but not more so than the rest of those who were similarly tempted" (p. 241).

There are, however, in Persia *firmans* and *firmans;* just as there used to be at the Horse Guards a "C. in C.'s List" and a "C. in C.'s *private* List," that meant very different things to candidates for commissions. How the extraordinary firman, that *meant* mischief, could come into play with excellent effect, may be read at pp. 253-254, but no space remains for extract.

Here let us notice the additional interest given to the work by its woodcuts, many of them from sketches by officers of the Telegraph. As among the most interesting we may specify that of the wire passing over the *Kotal Dukhtar* ("Jungfrau Pass"), between Shiraz and the sea, by Major St. John (p. 308); the Bastinado (reward of *trop de zèle*) by Captain Pierson (p. 537); the singular position of Yezd-i-khast, by Major Champain (p. 226); the capital Tom-Hood-like sketches of the Turkish soldier as he was, contrasted with the Turkish soldier as he is (pp. 428-429).

We now turn, for the brief space that remains, to that monument which stands so becomingly at the entrance of this record of successful enterprise—the Memoir of Colonel Patrick Stewart.

The official reputation of every public servant, unless he be one whom circumstances place at once on the page of history, rests largely in the hands of his successor. And it is pleasant to see the hearty affection and admiration with which Colonel Goldsmid writes of him whose successor he was. His paper is no perfunctory task; nor indeed had other motives than those that we have indicated rendered necessary the introduction of this memoir, welcome and appropriate as it is.

Fifteen years ago the Viceroy of India had under his authority for war or peace a certain body of officers, some 120 in number. Though, in the old formula of homely deprecation, "one says it who shouldn't say it," it may be doubted if any

corps in the service of England ever combined a greater variety of character and ability, with such zealous loyalty to the Government (in spite of chartered rights of grumbling), such hearty mutual regard and pride in one another. Here was a delicate machine, one should have thought, that a government might have deemed it worth while to bestow some care on, in removing defects, perfecting training, and utilizing widely. But the Powers that were (Powers not in Calcutta, but at Westminster) were possessed for the moment with the spirit which *Punch* ascribes to the Mining Districts, and in the sentiment, if not in the language, of that population, their whole utterance in reference to the organization aforesaid, seemed to be "Go to now! Let us heave a brick at it!" Anyhow Authority hung an extinguisher over the head of the Bengal Engineers, and we still watch its slow descent, as one after another of the old comrades retires from active service in India or on earth. Nevertheless, the lamp of the beloved corps seems to burn all the brighter in the shadow of descending fate. Soon in the revolving years it will have to go out. But Magdala and Dorking give us assurance in different directions that it will not go out in an ill odour; and the part played in the history before us by Stewart, Champain, St. John, and Pierson, does the same. No doubt it must have come to an end one day—"Time hath his revolutions; there must be a period and an end to all temporal things—*finis rerum*—an end of names and dignities, and whatsoever is terrene; and why not of"—the Bengal Engineers! Yet for the inevitable end that comes to all, it is not forbidden lovers and kinsfolk to lament.*

Stewart joined the corps only in 1852, and yet when he died, in 1865, there was no man of whom it was more proud than of him. His early success neither spoiled him, nor begot envy in others. His early death left blank, as all who knew his career believed, an eminent place in English history; perhaps not that, for his name may yet live there as the first to mould the Electric Telegraph into a weapon of war.

Colonel Goldsmid refers to Stewart as an example to be imitated. But it is the Collingwoods rather than the Nelsons that can be held up as examples. Ordinary men might as well aspire to assimilate their features to that eager and winning countenance—like "Young Harry's with his beaver up"—that forms the frontispiece and best adornment of this book, as take for a literal pattern that bright and ardent spirit, so rich in manifold gifts of God and in man's favour.

His last years of consuming labour were spent on the great task of which this book treats; and there seems something marvellously fitting in the fact that his tomb is beside that central point of the communication, that link between Europe and Asia, that glowing focus of past and future history—Constantinople; whilst a second memorial is dedicated to his name in Galloway, a third at Karáchi.

H. Yule.

Palermo, *August* 1874.

* All this applies in substance to the other two Indian corps of Engineers; but till recently presidential separation was rigid, and did not admit, as a general rule, of that strong common feeling here noted as characteristic.

Practical Notes on Marine Surveying and Nautical Astronomy. By *Captain Richard C. Mayne, R.N., C.B., F.R.G.S., late in command of the Straits of Magellan Survey.* (Potter, 1874).

In the absence of an efficiently organised naval surveying service, such as existed in the days of Sir Francis Beaufort, the chief reliance must be on the voluntary efforts of officers serving in various parts of the world, who have frequent opportunities of making useful additions to our foreign surveys. As a manual of instruction in surveying for the use of naval officers, Captain Mayne's work will be most valuable. It will serve two objects, both of which are of great importance. It will assist officers in the practical part of surveying, and it will, no doubt, incite many to a deeper study of the subjects which Captain Mayne treats chiefly from a practical point of view. In the opening chapter the importance is enforced of obtaining a fixed position by observation in commencing a survey, instead of adopting a probably unreliable latitude and longitude from the coast chart supplied by the Admiralty. The three next chapters give sufficiently complete instructions respecting the care of chronometers, taking sights for time, the observation of latitude by circum-meridional and double altitudes, and the variation and deviation of the compass. After obtaining a fixed position, the next operation is the measurement of a base, either by chain measurement, or the use of the micrometer, or by sound, or mast-head angles; the two latter methods being used when it is impossible to land. A chapter is devoted to the subject of base measurements; and another, containing many useful hints and suggestions, to triangulation and the delineation of coast lines. The chapter on soundings and tides will also be found to contain excellent practical instructions. In the latter part of his work Captain Mayne supplies volunteer surveyors with complete information respecting the plotting of work; including details as to the sizes of paper, drawing boards, stretching and mounting, sketching in details, projection and the plotting of a running survey. But not the least valuable part of this excellent little work is the concluding chapter, which contains many miscellaneous items of information, and the appendices. Captain Mayne, whose distinguished services in the survey of the Straits of Magellan are well known, has conferred a boon of no small importance on his profession by the publication of these practical notes, which will, we are confident, be as seed falling on fertile ground, and will produce an abundant harvest, in the shape of new surveys in all parts of the world.

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The Geography of British History: A Geographical Description of the British Islands at Successive Periods from the Earliest Times to the Present Day. By *William Hughes* (New Edition, Longmans, 1874).

History, without the aid of geography, is a barren and unintelligible study. The course of historical events cannot be clearly understood, without definite notions of the physical aspects of the region in which they took place; and especially is a knowledge of topographical details essential in the study of battles and other military operations. As an aid to this necessary combination of the study of historical events with geographical knowledge, Mr. Hughes's work is admirably conceived. After describing the physical aspects of England, Scotland, and Wales, he gives the distribution of tribes and races, and the political divisions at the several important historical epochs, a useful sketch of the progress of English colonization, and some topographical details touching the sites of battles and sieges. The book also contains information respecting geographical nomen-

clature and the derivation of names. The plan is certainly excellent; but more care should have been taken to secure accuracy in details; for unless a work of this kind is correct and perfectly reliable it loses half its value. We notice several inaccuracies in the chapters on battle-fields, which should be corrected in a future edition; and we observe that, as a rule, the sources of information quoted by Mr. Hughes are second-hand, and the details are meagre and insufficient. One is surprised, in these days, to see Hume quoted as an authority, while there is a total absence of all reference to such really reliable sources of information as are often to be found in local histories. This want of research has led Mr. Hughes into some serious blunders. For instance, we are told that the battle of Atherton Moor was fought in Lancashire. Such a notion renders it impossible to comprehend the important Yorkshire campaign of the summer of 1643. Atherton (more correctly Adwalton) Moor is near Bradford in Yorkshire, and Mr. Hughes would have found the fullest topographical details, respecting the memorable battle which was fought there, in *Scatcherd's History of Morley*. We would suggest also, that while the accounts of each battle-field in the text must unavoidably be in a closely condensed form, very full references to more complete information should be given in foot-notes. The book is capable of much improvement, but the design is good, and, with some additions and corrections in future editions, Mr. Hughes's *Geography of British History* may become a really valuable companion to the study of the annals of this country.

THE NIJNI-NOVGOROD FAIR, 1874.

FROM some of the Russian papers we gather a few interesting details respecting this great fair. Some do not hesitate to predict a marked decrease in its importance now that Nijni itself has become the centre of a network of railways. On the other hand, it is urged that the general increase of commerce resulting from improved communications renders it more than ever necessary for merchants to meet together at times and compare notes on the general condition of trade. The correctness of this view is borne out by the fact that the great fairs seem to do more business than they used. The Nijni fair began this year much later than usual, a fact which is ascribed to the improved communications which admit of traders fixing and so economising their own time for the transaction of business. The sale of manufactured products has been slack, and at much lower prices than usual. Eight houses, it is suspected, will be unable to meet their engagements in this line, and this will probably occasion a deficit of two million roubles. Furs have been scarce and have thus fetched higher prices; sixty thousand chests of fine teas have been imported, and on these a good profit has been made, while on the ordinary sorts there has been a very general loss. Every recurring fair at Nijni proves that the trade overland from Peking to Kiachta is on the decline, the competition of the sea-imported teas from Canton, and other ports, being too powerful. Only a small quantity of Canton tea, however, was sold, and this was limited to high-priced specimens of the finer sorts; the common sorts on the other hand were so absurdly cheap that people are clamouring for some strict customs legislation which will prevent these adulterated teas from being forced into the market by Koenigsberg merchants, as they are at present. As purchasers of high-priced teas, imported *viâ* Kiachta, are getting more numerous, one may anticipate that the inferior Canton sorts will gradually disappear from the market. Iron and wheat play the next most important part, and in these a good trade has been done. The sale of Central Asian goods has not yet begun. The sanitary condition of affairs is satisfactory.

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Cartography.

Erhard's Wall Map of France.*

AMONGST French cartographers one of the foremost positions is held by Mr. Erhard, and the wall map lately published by him would do credit to any author. Only, it must be treated as a wall map! Those who expect details commensurate with the scale of the map, or who examine it closely, or through a magnifying glass, may possibly feel disappointed. But let the four sheets be mounted, and the map suspended to a wall, as its author intends it to be, and its colours will be found to harmonize, its features to stand out clearly and distinctly. The map has been produced in chromo-lithography; the rivers are blue, the land is tinted green or brown according to whether it is fertile, arable, or sterile waste, and the hills are carefully and effectively delineated. The number of names is large (though they will not be found to interfere with the other features if the map be looked at from a distance. The railways, so important a feature on our modern maps, are shown in red. We are not exactly in a position to say that the map now before us fully realizes our ideas of what a map ought to be, but it is evidently a work of thought, and fully deserving the attention of all those engaged in the production of maps, or engaged in tuition.

Atlas of Swiss Industry and Commerce.†

IN Dr. H. Wartmann's "Atlas of the development of Swiss Industry and Commerce" we are presented with one of the most successful cartographical illustrations of statistical facts. The work consists of two sets of maps, together with a general map of Switzerland and a map of the world, showing the towns with which commercial intercourse is maintained and the routes by which Swiss merchandize is generally forwarded to them. The first set of maps illustrates the extension of the principal branches of industry in 1770, 1820, and 1870. The districts where each branch is carried on are tinted, and by comparing the maps, we are thus enabled to trace the gradual spread of each. The second set shows the countries to which Swiss manufactures were exported at the periods named, distinguishing the principal articles as well as the countries supplied direct and those supplied indirectly, through foreign merchants. The work is most instructive, and reflects great credit upon the "Swiss Commission for the Vienna Exhibition," at whose instance it has been published. The maps have been engraved and printed at Wurster and Randegger's renowned establishment.

Map of Canada.‡

THIS map has been compiled under the direction of Mr. Thomas Devine, the Deputy Surveyor-General for Ontario, who is already well-known for works of the same kind. It embraces the whole of the Dominion from the gulf of St. Lawrence to Manitoba, shows the boundaries of counties, position of principal towns, and lines of rail, and is coloured to indicate the nationality of the present settlers. This map amply justifies the proverb of "Birds of a feather flock together," for English, French and Germans, Irish and Scotch, they all—as far as the big and uniform patches of colour upon the map permit our forming an opinion—occupy continuous tracts of country.

E. G. RAVENSTEIN.

* France, par Erhard. D'après la carte oro-hydrographique publiée, sous les auspices du ministère de l'instruction publique, par la Commission de la Topographie des Gaules. 1:800,000. Paris, 1874 (Size 6¼ by 7 feet).

† Atlas über die Entwicklung von Industrie und Handel der Schweiz, von Dr. G. Wartmann. 8 maps, with notes in German and French. Winterthur, 1873. (London, Trübner), 25s.

‡ Government map of part of the Dominion of Canada, compiled under the direction of Thomas Devine. Scale, 28 miles to the inch. Ontario (Office of Crown Lands), 1873.

Log Book.

The Congo Expedition.—News has been received from Lieutenant Grandy, who was at Sierra Leone, on his way home. He appears to have failed in his great object of ascending the Congo; but he has gone over much new ground, and valuable geographical information may be anticipated as the result of his explorations.

Geographical Work in Bolivia.—The residence of Captain Musters, R.N., the explorer of Patagonia, in the capital of Bolivia, is producing much valuable geographical work. He has fixed the position of Chuquisaca or Sucre, the Bolivian capital, with the aid of Captain Cilley, late of the United States Navy, and Mr. Minchin, C.E. The longitude, from the mean of thirty lunar distances, is 65° 30′ W. The latitude 19° 2′ 30″ S. The height above the sea 9233 feet. Mr. Minchin has fixed the latitude of Potosi at 20° 18′ 33″ S.

Routes between Bolivia and Paraguay.—In June 1874 Commander Cilley, a retired officer of the United States Navy, arrived at Chuquisaca from Buenos Ayres, by way of Paraguay, Otuquis, and Curumba, to Santa Cruz de la Sierra. After spending four months in verifying the work of Captain Page of the 'Waterwitch' expedition of 1859, Captain Cilley ascended the Otuquis to points never before reached, finding its true course, and also that it is navigable for river steamers up to a point where there is firm ground fit for commencing a railroad, and plenty of timber for sleepers. On his arrival in Bolivia, the Government of that Republic organised an expedition to pass from a place called Sauces, on the frontier, to the Otuquis, following, if possible, the 19th parallel. The expedition is commanded by Colonel Mujia, who is assisted in the scientific work by a young German named Arturo Claudius; and fifty Bolivian soldiers are to form an escort against the savage Indians. Claudius joined the expedition at the instigation of Captain Musters, and will forward his observations to that office for computation. Mujia is eventually to proceed to Curumba, to lay down the boundary line between Bolivia and Brazil.

Colonization in Peru.—A small French colony has been formed on the eastern slopes of the Peruvian Andes, in the valley of the Chanchamayu (east of Tarma), on a somewhat smaller scale than that of the German colony on the Pozuzu. The French settlers are under the lead and guidance of a M. Davis. In July 1874 the Peruvian Government despatched an expeditionary force to explore the lower course of the Chanchamayu, which, at the latest dates, had passed Fort Merced and crossed the river by *balsas*. The force was divided into two columns. One, under Colonel Ayarza, with considerable difficulty reached the banks of the river Tulumayu, opposite Fort San Ramon. The French colony is established round Fort Merced, where the young Frenchmen have commenced to clear the land for cultivation, while they have volunteered to serve under Colonel Ayarza, in the event of hostilities from the wild Chuncho

Indians. The health of the colonists is good, and they express themselves as contented with the prospects before them.

A Russian Railway from Tiflis to Tehran.—A project which has for some time been talked of in Russian circles and discussed in various publications, has now assumed a more decided shape. For the last few months a Russian Engineer Officer has been residing at Tehran, with the view of gaining the consent of the Persian Government to the construction of a railway between Tiflis and Tehran. Every guarantee will, it is said, be freely given by Russia, and the Shah's government appears not unfavourable to the scheme. Our Foreign Office, however, as might be supposed, is raising the most strenuous opposition. The end of the affair will not unlikely be that to avert this danger, England may have to disgorge a larger sum than would have bought up Baron Reuter's concession. The moral is much the same as might be drawn from the Suez Canal affair. Considering in both cases it is England who really pays, we may well exclaim *Sic nos non nobis!*

Exploration of Sumatra.—The Dutch Geographical Society has determined to equip and despatch an expedition, with the object of exploring the little known portions of the east coast of Sumatra.

Roman Catholic Mission in Mongolia.—Father Verlinden, one of the Belgian missionaries of Mongolia, has communicated to the *Indo-European Correspondence* of Calcutta an interesting letter descriptive of his journey through the Ordos country. He and his companion followed the same route as that taken by the Jesuit Surveyors in the last century (see *Ocean Highways* for February 1874, p. 475), and crossed the still frozen Hoang-Ho at Totochung, 28 leagues south of where Prjevalski, and within 18 of where Huc and Gabet crossed. Father Verlinden describes the Ordos country as 120 leagues long from east to west, and 30 from north to south, and as divided into seven petty kingdoms, whose chiefs acknowledge the sovereignty of the Chinese Emperor. The Ordos inhabitants have not forfeited the character for honesty they earned in the time of the Emperor Khang-hi, for the missionaries could leave their baggage outside the tents and their horses loose without fear. The ravages of the Muhammadans, who invaded the Ordos country in February 1868, were fearful, and it is calculated that four-fifths of the inhabitants were put to the sword by them. Cattle were carried off, and all dwellings, tents and temples were burnt. The Muhammadans remained masters of the country for five years, and were finally driven back by the Imperialist troops. The missionaries find the people most amenable to Christian teaching; they willingly share their food with the fathers and will not accept payment. It is said the Emperor of China has sent large sums to the Ordos chiefs to enable them to bring their people back, and buy live-stock and seed, for at present the survivors only eke out a bare subsistence on game and mushrooms. At Ning-cheo-leang, where Father Verlinden writes from, a small colony of about 200 Christians, who had originally emigrated from Shensi, existed previous to the Muhammadan invasion. The spiritual wants were administered to by the Franciscan fathers of the Vicariate Apostolic at Si-ngan-fu; but on the irruption of the Muhammadans some hundred and forty were murdered, the rest remaining concealed in the ruins of houses. The Chinese soldiers of the garrison finding themselves outnumbered suffered themselves to be butchered to a man in their barracks without resistance. It is supposed that if the Christians had had the courage to declare their religion they might have been spared, as the Muhammadans, whose object it was to seize Peking, have a dread of offending the Christian powers, and spared one man who announced that he was a Christian. The Belgian missionaries intend to establish a boarding school for boys, and thus partially cut off the source from whence the lama hierachy is supplied.

The French Mission to Burma; Death of Captain Fau.—We regret to have to announce the death of this promising young officer, who, with Captain Moreau, was attached as scientific member to the French Mission to Burma. The treaty of commerce concluded with the Burmese plenipotentiaries last year necessitated the despatch of a return embassy on the part of France, and M. de Rochechouart, the French Minister in the East, was entrusted with the charge of the mission, which arrived at Mandalay at the close of 1873. Captains Fau and Moreau, who intended to remain behind and explore for about a year, were most kindly received by the king: his majesty, not content with providing them with escorts and means of transport, would have fain thrust money upon them. After three months' sojourn at Mandalay, they sailed on the 2nd of April for Mone, a town of about 20,000 inhabitants. They proposed to traverse the country between the Irawadi and the Salwen, and to make for Kiang-Hung on the Mekong River. The town of Mone is situated partly on the slope and partly at the foot of a hill, and presents a picturesque appearance, the numerous pagodas and houses being embowered in trees. But the luxuriant woods which skirt the town at the base are bounded by extensive rice-fields, and fever here is rife in the rainy season. Fau and Moreau, however, arrived during the dry season, and it was not till the 26th of May, when they were preparing to leave, that the approach of the rains brought their dread concomitant evil. At the end of the month many of the party were laid up, and three natives subsequently died. At the beginning of July Captain Fau had been confined to his bed for five or six days with a sharp attack of jungle fever, but Moreau unfortunately hesitated to administer quinine for fear of aggravating the malady, and the disordered state of the bowels. On July the 9th the invalid rallied, and preparations were made to take him to the hills in the vicinity of Kiang-Hung. But it was too late; the following day the fever returned with redoubled intensity, and Captain Fau breathed his last on the 11th of July. The natives have made a coffin of teak to convey the body to Mandalay, from whence it will be taken to France. It is unfortunate that Moreau had not with him some valuable notes of Dr. Thorel, who, while attached to the former French Expedition up the Mekong River, in the capacity of surgeon, made a special study of the fevers prevalent in this region, and had been most successful in his treatments.

Proceedings of Geographical Societies.

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BRITISH ASSOCIATION.

Section E.

We supplement our report on the Meeting of the Geographical Section of the British Association by a few additional details concerning subjects which may be assumed to be of general interest.

Arctic Exploration.—At a committee meeting, held on the 20th of August, Admiral Ommanney proposed "that the Council of the British Association should be requested to take such steps as they might think desirable for supporting the request to Her Majesty's Government to undertake an Arctic Expedition, on the basis proposed by the Royal Geographical Society, at the beginning of the present year, and which proposition, it was understood, would be again made by that body." The Council acceded to this request, and we trust soon to be able to report that preparations for fitting out an expedition are actively in progress. In the discussion which followed the reading of Admiral Osborn's paper, Admiral Ommanney said that he had not the least doubt about the North Pole being now within our reach, especially as our means of travelling had improved wonderfully since Parry's memorable expedition. If Hall's crew had been as disciplined as the crew of a man-of-war, he would no doubt have succeeded in reaching winter-quarters within easy reach of the Pole. He considered that Esquimaux dogs, which could readily be procured in Greenland, would prove better auxiliaries than reindeer. Smith Sound, in his opinion, offered the most advantageous base to start from, and a well-organized government expedition had more chance than one started by private enterprise. Captain Griffith Jenkins said that Arctic expeditions were likely to promote largely the science of electricity. Our knowledge of electricity had made much progress since the earlier expeditions to the polar regions, when Ross and Parry discovered the magnetic pole. Electricity was now largely employed in our communications in all parts of the world, and as no lightning occurred in the polar regions, nor electric disturbances, these appeared to offer the greatest advantages for a successful investigation of that subject. Mr. John Ball thought it would prove interesting to ascertain the rate of upheaval of the land, now going on not only in Spitzbergen, but over a large portion of the polar regions. He also recommended that the Arctic glaciers should be explored, for they might probably afford some information more certain than that derivable from the Alps, as to cyclical changes of the seasons.

We cannot do better than conclude this notice with the concluding words of Major Wilson's able address. He said, "As regards the general subject of Arctic exploration, there can, I think, be no doubt that that by Smith's Sound would yield the most important scientific results, and would at the same time offer great facilities for reaching the Pole itself. It should not be forgotten that all recent polar expeditions sent out from this country have been despatched with the special object of ascertaining the fate of Sir John Franklin, and that discovery was not a principal object . . . . In the words of a well-known Arctic explorer, 'what remains to be done is a mere flea-bite to what has already been accomplished.' Morton, the second mate of the 'Polaris,' says, as the result of his third voyage, that he is 'more than ever convinced of the practicability and possibility of reaching the Pole'; and, if I may express my own opinion, it would be, in the words attached to a picture at the last exhibition of the Royal Academy in London, 'It is to be done, and England ought to do it.'"

Colonel Gordon on the Upper Nile.—Major Wilson read a letter recently received from Colonel Gordon, R.E., who is now in command of the Egyptian forces on the Upper Nile, and which is dated Sobat River, 26th June 1874. Colonel Gordon says:—"We arrived from Khartoum a week ago, and have made a station here, and great friends with the Shilluk natives, who come across in great numbers from the other side of the river. They are very poorly off, and I gave them a little grain—a very little contents them. I have employed them to plant grain, and they do it very fairly. They do not do it for themselves, for it would probably be taken from them. . . . . I hope to get their confidence, and really do something at each of my stations; of course, it is infinitely small amongst the mass, but may solve the question whether the negro will work sufficiently to keep himself if he has security of life and property." Colonel Gordon had sent notice to three slave stations on the Bahr Giraffe to be abandoned. He had also received intimation that a caravan with 2,000 cows that had been stolen, and a number of slaves, was on its way to the station Fashoda (opposite the Sobat), and proposed to intercept it on its way down, take the slaves back to their own country, and punish the slave-dealers.

From information received subsequently, we learn that the gallant colonel was still at the Sobat towards the end of July, and was preparing an expedition to explore the Sobat River. We learn, too, that a large slave caravan was captured by the Egyptian authorities in Southern Kordofan. This was probably the caravan alluded to in Colonel Gordon's letter, whose charitable intention of taking the slaves back to their own country was not, however, carried out by the captors, for 137 men were enrolled in the Egyptian army, 331 women were given in marriage to soldiers, and 96 children placed in the Khedive's schools. Thirty-seven slaves died after the capture.

Professor Carpenter on Oceanic Circulation.—In an eloquent and lucid address, which was listened to by an attentive audience, Dr. Carpenter developed his well-known views on the general circulation of the ocean. He again took this opportunity to state that his theories had been anticipated by Dr. Lenz, of St. Petersburg, as far back as 1845, but that his own conclusions had been arrived at independently, for his attention had only recently been directed to Lenz's investigations.

Mr. John Ball said that Dr. Carpenter's theory might be looked upon as having satisfactorily been established, still the influence of such agencies as winds, friction, &c., must not be overlooked, and the Gulf Stream was due, no doubt, to an accumulation of forces. Lieutenant Chermside said he looked upon differences of specific gravity of the sea-water, caused by variations of salinity, as the main cause of ocean currents. A body of warm water, by containing more salt, might thus underlie the colder strata, and this he had actually ascertained to be the case in the Spitzbergen seas. Mr. Aitken said he had made trough experiments with hot and cold sea-water, and his results differed in several important particulars from those obtained by Professor Carpenter. The latter, in reply, stated that most of the objections raised had previously been anticipated, and carefully considered. Future deep-sea temperature observations would be taken with a new thermometer ingeniously constructed by Messrs. Negretti and Zambra, and it was now possible to ascertain the temperature at any given place below the surface, whilst the old thermometers had registered merely the maximum and minimum temperature of the strata through which they passed. He proposed to continue his trough experiments on an enlarged scale. He fully recognised the influence of winds, differences of salinity and other causes upon currents. In the opinion of Mr. Hawkshaw, however, friction exercised no perceptible effect, whilst the slightest diffefence in the specific gravity was capable of producing movements of water on the largest scale. Dr. Meier, of Kiel, who was now at the head of a scientific

commission for exploring the German seas, and who had devoted much attention to the subject under discussion, fully shared his views.

NIKITIN'S TRAVELS.—Mr. Delmar Morgan stated that he had learnt since his arrival at Belfast that a commentary on Nikitin's travels by Mr. Major had already been published in one of the volumes of the Hakluyt Society, but that, as his own commentary contained a great deal of original matter, he felt justified in placing it before the meeting.

The paper having been read, M. de Khanikof thanked Mr. Morgan for so frequently placing the results of Russian geographical explorations before the English public. He considered the elucidation of the accounts of ancient travellers by the light of modern science to be of great importance. If the travels of Clavijo (so ably edited by Mr. Clements Markham) had been consulted in the compilation of our modern maps of Central Asia, they would have gained much in accuracy.

THE KASHGAR MISSION.—Colonel Biddulph's paper having been read, Sir George Campbell traced the history of geographical discovery in Central Asia, and paid a high tribute to the scientific attainments of Dr. Stoliczka, by whose untimely death we had been deprived of much valuable information. The Rev. J. Edkins, late of St. Petersburg, said that Eastern Turkistan was permeated with Chinese ideas, and would no doubt be recovered by China, unless England and Russia combined to prevent it. M. de Khanikof congratulated English travellers upon the success they had achieved in the face of difficulties of no mean kind. Mr. Ravenstein drew attention to the work performed by native explorers, and placed before the meeting a manuscript map of the country between Peshawar and the Upper Oxus, based upon surveys made by a native in the employment of the government of the Punjab, and now the property of Dr. Leitner.

PALESTINE EXPLORATION FUND.—At the request of the Geographical Section 100*l.* have been granted by the Council to this fund for the purpose of promoting the survey of that country, and particularly of ascertaining the difference of level between the Mediterranean and the sea of Galilee.

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IN addition to the papers read before the Geographical Section, several of a kindred nature were brought before other sections, and we deem it of some interest to furnish abstracts of these likewise.

Charts on Gnomonic Projection. By G. J. MORRISON.

The author points out that Mercator's charts give very inaccurate ideas of the real distance between any two distant ports: for instance, a straight course on one of those charts between Hong-Kong and San Francisco would be 470 miles longer than a great circle route. He said that sea captains sometimes make short voyages in spite of their charts, rather than by their aid. For these reasons he advocated the substitution of charts on gnomonic projections. In a map sections of the globe have to be represented on a flat surface, hence most maps embracing large areas give inaccurate ideas of the most direct routes. For instance, the direct route to Calcutta from England is popularly supposed to run through Constantinople, whereas it really passes through Russia, far to the north of the Black Sea.

On the Cause of the Progressive Motions of Cyclones and of the Seasonal Variations in their Paths.

In his paper on the above subject, Dr. Ashe pointed out the importance of arriving at a knowledge of the probable path of cyclones over the ocean, and of the variations which had been found to occur in their paths at different seasons. To trace their paths we must first arrive at a knowledge of the causes of their onward progress. The author resolved these causes into two classes: those which were inherent in the cyclone itself, and those which depended on the trade-wind, or other general current, within which the cyclone might originate. The resultant of the paths due to these two causes would give the actual path along the surface of the ocean. Now, cyclones were found to move directly to polewards when they were near the tropics, where they were free at once from the influence of the trade-winds and that of the counter-trades, and the author therefore considered that this was the direction of path belonging to the cyclone itself, which he accounted for by supposing that the eastern half of the cyclone had an excess of motor force over the western, in consequence of the air which it drew in from equatorwards adding to the speed of the wind's motion, since it moved eastward faster than the centre, while air from polewards retarded the motion of the western half of the cyclone, since it moved more slowly to eastward than the centre. When the motion of the trade-wind to N.W. in the southern hemisphere, and to S.W. in the northern, was added to the proper poleward motion of the cyclone, we arrived at the very path which observation had shown these cyclones to follow. Similarly, the motion of the counter-trades to N.E. in the northern, and S.E. in the southern hemisphere gave, when combined with the poleward motion of the cyclone itself, the exact path observed to be followed outside the tropics. The difference in the force of the trade-wind at different seasons of the year would thus be seen to be the cause of the variations observed in the path of cyclones, and the results so arrived at by this theory were in strict accordance with the facts so observed. Hence the author hoped that a step might be considered gained by this theory towards a knowledge of the probable path of any given cyclone which a mariner might find himself involved in at sea.

On Cyclone and Rainfall Periodicities in connection with the Sunspot Periodicity. By CHARLES MELDRUM.

The paper commenced by stating that the catalogues of cyclones experienced in the Indian Ocean, from 1847 to 1873, submitted last year, indicated that during that period the number of cyclones in the space between the equator and 34° S. latitude, and the Mauritius of 40° E. and 110° E. was much greater in the years of maximum than in the years of minimum sunspot frequency. The author believes that there is a strong probability that cyclone fluctuation is consistent with a similar fluctuation of the rainfall over the globe generally.

The Absorption of the Sun's Heat-rays by the Vapour of the Atmosphere. By the Rev. F. W. STOWE.

The observations of solar radiation which were relied on in the paper, were taken with "blackened-bulb thermometers in vacuo" suspended 4 feet above the ground, the indicators of which, when compared with those of the ordinary shade thermometers, gave a measure of the intensity of the solar rays.

The absorption of the direct solar heat-rays by the vapour of the atmosphere is proved in several distinct ways:—

1. It is found that the elastic force of vapour is less on the ten days in each month on which radiation is most powerful than on an average of the whole month.

2. It was also found that N. and N.W. winds, which contain little moisture, are very favourable to solar radiation, whereas S. and S.E. winds are usually accompanied by much less powerful sunshine. The N.E. winds of spring, which are excessively dry, are also accompanied by intensely powerful solar radiation.

3. By frequent observations during cloudless weather, with nearly constant vapour tension, curves are obtained representing the daily variations in solar radiation produced by the changes in the sun's altitude, and consequent alteration of the length of the path which the beams pursue through the atmosphere. In fact,

the sun's rays are more intense in winter than in summer, when the difference of altitude at noon is allowed for, because the absolute amount of vapour in winter is so much less. About 10 or 12 per cent. is the winter minimum of absorption of the sun's heat-rays, while the summer maximum equals or even exceeds 20 per cent.

On certain Protracted Inequalities of Atmospheric Pressure in the Indian Monsoon Region, and their relation to Variations of the Local Rainfall. By Henry F. Blanford, F.G.S.

The author draws attention to a fact disclosed by a discussion of the barometric registers for the last seven years, viz., that the abnormal peculiarities of relative pressure distribution, which may appear in any season, tend to last for many months, and in some cases throughout several alterations of the monsoons. Throughout variations of pressure, even when these are such as accompany monsoons, neighbouring regions are found to maintain a nearly constant difference of pressure which only decreases very gradually. In noticing the rainfall, he said that the heaviest was found to be in advance of the centre of the cyclone. A satisfactory determination of their relations cannot be obtained until the pressures in different Indian districts are better known.

On the Progress of the Geological Survey of Ireland. By Professor Hull.

In exhibiting the new index of geological signs and colours, which had just been prepared in the Geological Survey of Ireland, Professor Hull gave a short sketch of the origin and progress of the survey, observing that it had originated in 1832, with that of the late General Pollock, and his assistants, who had published the well-known report on the geology of Londonderry, Tyrone, and adjoining districts in 1843. With this report it had been intended to publish exhaustive reports on the botany, zoology, and mineralogy of the districts, and Mr. Oldham, afterwards the director of the survey, was appointed to undertake the last-named department. During the Government of Sir Robert Peel the idea of undertaking any other branch of natural history other than geology was abandoned, and in the year 1844 the surveys of the United Kingdom were detached from the Ordnance, and placed under the Woods and Forests. Sir Henry de la Beche was appointed the first Director-General, while the Survey of Ireland was under the direction of Captain (afterwards Colonel) Sir Henry James. In 1845 the Act of Parliament was passed, under which—the Survey Act giving them the right of entry on lands—Captain James, with a small staff of assistants, commenced operations in the vicinity of Dublin, and southward through Wicklow into Wexford. He was succeeded by Professor Oldham, who left in 1850, when the latter was appointed to the Geological Survey of India. Professor Oldham was succeeded in the directorate by the late Professor Jukes, who, with a slightly increased staff of surveyors, including the late Mr. Du Noyer and Mr. Kinahan, the present district surveyor, completed the survey of a very large portion of the south, centre, and west of Ireland. In 1855 Sir Henry de la Beche died, and was succeeded by Sir R. I. Murchison. On his death, Professor Ramsay was appointed. The districts recently completed are those of Connemara and West Mayo, by Messrs. Kinahan, Warren, and Symes; of the Morne Mountains, by Mr. Traill; the vicinity of Antrim, by Mr. Duffin; the Dungannon district, by Mr. Hardman; and that of Armagh, by Mr. Egan; together with other portions of Westmeath, Longford, and Mayo, by Messrs. Wilkinson, Cruise, and Leonard. These surveys are surveyed on the scale of 6 inches to a mile, and field maps, from 1852, were reduced and engraved on the Ordnance maps to a scale of 1 inch to the mile, which are published through the agents, both in Belfast and Dublin. These maps are not generally hill-shaded, but it is intended to publish all the geological details of the district north of a line drawn from Clewe Bay on the west to Dundalk Bay on the east on maps having the physical features shown by shading. The survey of the Dungannon coal-fields has just been completed, and the results are being prepared for publication. This is also true with regard to the Leitrim and Roscommon coal districts. At present a fresh survey of the Leinster coal field is being carried out. Great pains are also being taken to portray accurately the extent of the deposit of iron ore of County Antrim, and considerable advance has been made in the survey of that district.

The Koragars, a Leaf-wearing Tribe on the Western Coast of India. By W. J. Walhouse.

The author commenced by describing South Canara, the most northerly of the Madras Provinces, lying nearly midway between Bombay and Cape Comorin. Being posted at Mangalore, the head-quarters of the district, for several years, he often met with the people about to be described, the Koragars, a remnant now numbering but a few hundreds of the aboriginal slave castes, having this distinctive peculiarity, that the women wore aprons or screens of woven twigs and green leaves over their buttocks. In old times both sexes were allowed to wear only these leafy aprons for clothing; the custom was now confined to the women, and was an instance of how what was once a badge of degradation might become a cherished observance, for the leafy apron, though useless, being worn over the clothes, was still retained by the women, who thought that leaving it off would be unlucky. The people themselves were a very quiet and inoffensive race, small and slight, the men seldom exceeding five feet six inches; black-skinned like most Indian aborigines, thick-lipped, noses broad and flat, and hair rough and bushy. Their chief occupation was basket making, and they must labour for their masters. They lived on the outskirts of villages, and might not dwell in houses of clay or mud, but in huts of leaves called Koppas. Like many of the wild tribes of India, they were distinguished for unswerving truthfulness and the "word of a Koragar" was proverbial, and was always accepted. Numerous slave castes existed throughout India, and were regarded by their Hindoo masters with boundless contempt and loathing, curiously tinctured with superstition, for they were believed to possess secret powers of magic and influence with the old malignant deities of the soil, who could direct good or evil fortunes. Like all the slave castes and lower races, the Koragars worshipped Mari Amma, the goddess presiding over small-pox, and the most popular deity in Canara, represented under the most frightful form, and worshipped always with bloody rites. All the Hindoos believed that the Koragars have a language of their own, understood only by themselves; but it seemed doubtful whether this was anything more than an idiom or slang, such as was current amongst almost every caste and profession in India. They had, together with one or two other divisions of the slaves, a curious custom, scruple, or prejudice against carrying any four-legged animal dead or alive. This extended to anything with four legs, such as chairs, tables, cots, &c., which they could not be prevailed upon to lift, unless one leg was removed. As they all work as coolies, this sometimes produced inconvenience, and the only reason assigned for this prejudice was lest they should be treated as deformed. The author added that, on visiting Mangalore three years ago, after a considerable interval of absence the number of women wearing the leaf aprons behind seemed perceptibly to have diminished, and very possibly the custom might, in a generation or two, become extinct.

Sir Walter Elliott said that the practice of wear-

ing leaves was by no means confined to this one tribe in India. On great festivals to Kali, the women, in fulfilment of vows, would walk in procession covered with leaves, and surrounded by their female friends.

General COTTON said that leaves were frequently worn, not as a sign of caste, but to save clothing. In many parts of India when the people were employed in baling water, or in irrigation, they made themselves leaf aprons. It was not the fact that there was an isolated race only using leaves for clothing. He rather questioned the story of the Koragars having been condemned to use the leaves as a servile badge. It was founded on mere supposition, and a legend of their own.

On the Distribution of the Races of Man inhabiting the Jummo and Kashmir Territory. By FREDERICK DREW, LL.D., F.G.S.

The author first describes the races found in the basins of the Chinab and the Jhelam Rivers, viz., the Dogras, Paharis, Kashmiris, and Chibhalis. These races are of Aryan origin, and, though differing from each other, have all a countenance of a distinct Aryan type. The Dogras occupy certain portions of the outer ranges of the Himalayas, from the foot of the hills, at a level of 1000 feet above the sea, to heights of 3000, and perhaps 4000 feet. They are a race of fair height, but slim; active, but not powerful. They have well-formed and rather delicate features. Their complexion is of a brown colour, like that of the almond husk but rather darker. They are divided up into castes, in great part corresponding with those found among the other Hindus. The Paharis occupy the higher mountains next beyond; their dwellings are at heights of from 3000 or 4000 feet up to 9000 or 10,000; they are, moreover, in some cases situated between mountains of much greater altitude. The men of this race are stronger and of a more powerful frame than the Dogras, but still they are active. They have good features, thoroughly Aryan, a good brow and a decidedly hooked nose. Both in appearance and disposition they are decidedly different from the Dogras; their habitation among the hills where snow falls has been the cause of many differences, both in their customs and in their nature. In the Kashmiris the differences existing between the Dogras and the Paharis, at all events as far as physique is concerned, are carried further. The Kashmiris have a very powerful frame, broad shoulders, muscular backs, and strong limbs. In feature they present probably the best form of the Aryan tribe of countenance. They commonly have a high and wide forehead, a square brow, and a well-shaped nose, which in the older people becomes curved. The Kashmiris occupy their own enclosed valley of Kashmir, and have spread from it somewhat and formed isolated colonies both in the neighbouring hills and at a greater distance. The Kashmiri language is one of a group of languages or dialects. The Paharis speak not one, but several dialects. In language as well as in physique a passage more or less gradual can be traced from the Dogras through the Paharis to the Kashmiris. By far the larger portion of the Dogras are of the Hindu religion and the Paharis are almost entirely of that religion. The Kashmiris were originally Hindus, but nine-tenths of them are now Muhammadans. The Chibhalis are all Muhammadans, who have separated from the others, and might now be called a distinct race. The Chibhalis extend from the outermost hills between the Chinab and Jhelam Rivers northward over mountains of 8000 or 10,000 feet in height. To the north and north-east of the snowy range of mountains they found a race of Aryan origin, the Dards, who came into these territories from the north-west, their furthest point in a southerly direction being four days' march from the capital of Kashmir. The Dards are tall men, broad shouldered and well proportioned, bold and active mountaineers. Their religion is now for the most part Muhammadan. The author also described three sub-divisions of the Tibetan race, viz., the Champas, the Ladakhis, and the Baltis, found adjacent to the other Aryan races already mentioned. The paper was illustrated by a very clear and intelligible map, and also by photographs.

The Peoples between India and China. By Sir GEORGE CAMPBELL.

The author said that from his official position, he had an opportunity of seeing a good deal of the people in India and China, and hearing a good deal about them. He had collected and printed a large number of languages of their tribes, and had classified them as far as they could be with reference to their various affinities. The eastern tribes lying between and partly covering the Himalayas he described as possessing in their language considerable affinity to the proper Chinese. Many of the people about Darjheeling spoke dialects of the Tibetan language, but their civilisation was distinctly Chinese. The Gara tribes had very little civilisation, and what there was was of the Chinese type. They, in common with the Chinese, regarded drinking milk with horror, although they had no objection to eating puppy dogs. Their language, together with that of the people on the Hill Tipporeh, was a dialect of the Couch, a language spoken by a very large group of people occupying the forests at the foot of the Himalayas and the lower hill south of the Himalayas. In Upper Siam the people were clearly Siamese, a most civilised race, with a language and literature of their own. Between the British possessions and Chittagong and the territories of the King of Burmah was a very considerable hill tract occupied by people of whom something had recently been discovered. The Looshai expedition enabled them to learn a good deal about a large tract of country inhabited by a people called Kooke, of whom the Looshais were a tribe. These Kooke tribes were undoubtedly a Hindoo-Chinese tribe, speaking a language different from the Siamese and Burmese, but still remotely affined to that group of languages. Between Upper Burmah and Upper Siam were a large group of Naga tribes, a very fine and independent race, remarkably like the finer class of Red Indians. The Singpos inhabit the country at the upper extremity between Siam and the Chinese empire. Sir George Campbell then described the Khassia tribes, and created considerable amusement among the audience, which was largely composed of ladies, by his account of the "women's rights" which are exercised by the female portions of the tribes. It seemed that amongst the Khassias the woman is the head of the family, and the property descends in the female line instead of the male. The ladies there exercise a pretty free right of divorce. The lady lives in her own house and on her own estate; she proposes to the husband and marries him, and if she does not like him he is speedily discarded and another substituted. One result of this great freedom of the women is that they do by far the larger share of the work. A traveller passing through the country has relays of women provided, who carry him on their back in a basket shaped like a strawberry pottle with a piece cut out. The men, feeling themselves to be the weaker vessels, were not responsible for the maintenance of the family, and naturally took it somewhat easily. If ladies of this country were prepared for the reversal of the position of the male, perhaps the men might be induced to allow them to take the lead.

On Modern Ethnological Migrations in the British Isles. By Dr. JOHN BEDDOE, F.R.S.

The author points out that in Britain, as in other countries, there is a constant stream of population towards the capital, flowing from all parts of the country, and comprising a considerable portion of the upper and

middle classes. Elsewhere, in Britain and in Europe generally, the rule was that migration took place from poor to rich, from ill-employed to busy and prosperous districts, and instances to the contrary were comparatively rare, or of little importance ethnologically. In Scotland there were two currents of migration, one southward and south-eastward and towards England, the other towards Glasgow. The vigorous, ambitious, and prolific race of the south-east of Scotland was already scattered all over the world. Such names as Scott, Turnbull, Kerr, Douglas, Irving, and Bell afforded sufficient evidence of this; and Ireland swarmed with Armstrongs and Grahams, not all of them, it was true, descendants of voluntary immigrants. The large towns, however, were the great centres of attraction, and the more Celtic of the people furnished the masses attracted. Thus, Glasgow, from the rapid influx of Irishmen and Highlanders, was becoming as Celtic a city as Dublin or Belfast if one might judge by the evidence of features and family names. With Edinburgh the case was otherwise, though there even the Celtic element was strong in the lower classes, and the agricultural population around had been displaced by Irishmen to a considerable extent; still the difference of physiognomy and complexion between the street population of the two cities was very well marked. The case of Liverpool was much the same as that of Glasgow. In Manchester and Newcastle, and in most of the colliery districts of the North of England, Irish blood abounded, while the national Irish characteristic of natural eloquence came out in a very curious way, the spokesmen and leaders of the colliers and ironworkers in their trade disputes very frequently bearing Irish names. In London Irishmen were not relatively numerous, and Bristol furnished an example of the small importance of mere proximity; for notwithstanding the easy communication with populous Munster, the Irish element did not exceed three per cent. In Ireland itself Dublin was, of course, formerly—but Belfast now—the great focus; but in many smaller towns notable prosperity, whether engendered by political or social causes, or by the practical genius of a Teutonic colony, had in the end attracted the neighbouring Celtic population, so as almost to redress the ethnological balance. Of this Bandon and Enniskillen were good examples. The ethnological changes were, however, in a great degree limited to towns and to iron and coal districts. In some rural districts of Ireland and Scotland the Celtic element did undoubtedly encroach on the Teutonic, but it was very gradually and slowly done, and the day was yet far distant when the landmarks of race would be obliterated. And even in the towns the rate of progress of this movement could not be very accurately calculated so long as they were without data to show the relative potency of acclimatisation and degeneration determining the respective death rates of the different elements of urban populations.

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DRESDEN GEOGRAPHICAL SOCIETY.

The work of this scientific body deserves to be much more extensively known than it is. Amongst the varied assortment of papers which are contained in the annual journals since 1862, the date of the foundation of the Society, there are many of exceptional interest, which we regret that want of space prevents us doing justice to. The Society numbers 299 ordinary and honorary members and 41 corresponding members, among which however, we perceive but few foreign names; it would be a decided advantage to enlist the co-operation of members of other Societies abroad, who would contribute information and diffuse a knowledge of the doings of the Dresden body. The regular meetings are monthly, but weekly meetings are also held for the purpose of reading papers of minor importance. There is, moreover, a section of the Society charged with the special duty of watching over the mode of instruction and educational appliances used in teaching geography and kindred subjects. This section also meets occasionally to consider any new scheme or proposals submitted to it.

The Fisheries and Seal-Hunting in the White Sea and Northern Ocean.

This paper, contributed to the *Journal* for 1873-4, by M. A. Schultz, President of the Astrakhan Fisheries, affords a good deal of information on an important industry, of which but little is generally known. Most of the fishing villages, and all the largest ones, are situated on the south and south-west shores of the White Sea. Along the shores of the estuaries of the Petchora and Mezena Rivers there are a few villages and huts studded at intervals. Along the Murmanian coast opposite, which stretches as far as Norway, there are no regular fishing settlements, but only huts and storehouses left untenanted during the winter. About 5000 fishermen repair thither annually from the shores of the White Sea, and from April to the middle of August take part in the cod-fishery off the coast. Only the better class and such as can afford well-equipped schooners venture out as far as Novaya Zemlya. The annual value of the fisheries amounts to about 2,000,000 roubles, being considerably less than that of the Caspian. This is mainly attributable to the severity of the climate and to the paucity of sustenance for the fish brought down by the rivers. The villages are so far apart that each conducts its operations unaided. As far as the methods of catching and preparing the fish are concerned, the Astrakhan fishermen are far in advance of their northern brethren, who generally prepare their fish very carelessly, always excepting the herrings, which are salted by the monks of the island of Solovezk, and the salmon caught in the Dvina and Onega Rivers. The fishermen are not unacquainted with the more careful modes of preparation, but, in the first place, there is not much prospect of a market for the better qualities of dried fish, and, secondly, they are unwilling to give up traditional customs.

In a list of the fish which frequent these seas and rivers we perceive the following:—Perch, cod, pike, salmon, and herrings—the last two alone being, however, of economical importance. Two kinds of herring are caught, one about 6 to 7¼ inches in length, and another of a larger size, both sorts being always to be found in the White Sea, and not resorting there temporarily. Those caught in the autumn are the fattest. To catch them they make use of drag nets, from 16 to 35 fathoms long, which require six men to work them. The fishing season begins about the middle of November and lasts till February. The net is plunged beneath the ice, and by means of a rope dragged up several times a day, while at night it is usually left in the water. A good haul will bring up about a hundred thousand fish, and as about 750 of these nets are at work all at once off the village of Soroka (the chief place) alone, some idea may be formed of the extensiveness of the fishery. In autumn the nets are longer, and the boats cast their nets in pairs. The nets which are dragged in to land are from 50 to 100 fathoms in length, and about 5 fathoms high, and with all fittings complete, cost about 150 roubles each. At the mouth of the Dvina River cylindrical or sack-shaped nets of a smaller size are used, while in December and January basket traps are not unfrequently set at the depth of about 3 fathoms below the surface. The herrings are not cleaned out, but are laid in rows and salted and then packed in jars, while in some villages they are smoked.

Of salmon, there are three species caught in these regions, the smallest weighing about five pounds, and the largest, which mostly come from the Dvina and Onega Rivers, as much as half a pud (20 lbs.). Two of the above-mentioned species spawn in September, and pass the following winter in the river, coming down to the sea in the spring, while the other species, which favours the clearer rivers, passes a whole year in them before

spawning. Weirs are erected zigzag fashion across the rivers with small apertures in them, opposite to which traps are set. Nets of different sorts and basket traps are also used, and in the dark autumn nights the salmon are not unfrequently speared with five or seven pronged forks. After being cleaned and salted the fish are exported to the interior of Northern Russia and to Siberia. Cod, flounders, and gadus are also salted for export.

When the nets are fastened together for a day's fishing, the united length often exceeds 6 miles, and the haul is a lengthy operation. The heads of the cod when caught are chopped off, while the bodies are cleaned and salted and exported to Archangel, whence they find their way to St. Petersburg, and to the Vologda and Olonez Provinces. The heads and entrails are thrown away in Russia, but in Norway a substantial amount is realized by converting them to use as fish guano.

From many of the coast villages vessels sail forth between July and September to Novaya Zemlya in quest of seals, walruses, sea-bears, and a small species of salmon. About 100 seals are annually caught with nets; walrusses are harpooned from boats or from the shore. A large walrus weighs usually 100 puds (4000 lbs.), and in such case the captors content themselves with bringing away the tusks, skin, and fat, the latter of which weighs about 560 lbs. Bears are shot, and if only wounded, receive the *coup de grace* from a hunting knife. They yield about 140 lbs. of oil, which is twice as valuable as that of the seals.

Dolphins are also caught in abundance both by nets and by harpooning, for the sake of their fat, which yields excellent oil. Along the eastern shore of the White Sea there is an extensive hunting of seals going on from the latter half of the winter or the beginning of spring till May. The hunters clothe themselves in reindeer skins, with a linen cloak and hood drawn over, which makes it hard for the animals to distinguish them against the snow. They frequently bivouac for days on the ice, using their boat as a sort of hut, and this renders seal hunting very dangerous, as the ice is frequently in motion. On the west coast the hunters use reindeer sledges, on which they pack the seal skins and so bring them home.

Whales are not unfrequently left high and dry on the Murmanian Coast by the retreating tide, and the Lapps have then a rich prize before them. In most of the villages on the shores of the White Sea there are boiling huts, and here the work is rapidly done. The quantities of oil exported annually from Archangel vary a good deal. In 1856, after the close of the war, it amounted to about 1080 tons, but since then it has decreased. The greater portion goes to England and Hamburg.

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FRENCH GEOGRAPHICAL SOCIETY.

Bulletin for May.

M. DUVEYRIER contributes an abstract of Major Roudaire's recent paper on the creation of an inland sea in Algeria, which is further illustrated by a sketch-map showing the probable extent of the sea in question. Our readers must know, however, that this splendid scheme has opponents. M. Edmond Fuchs, a mining engineer, deputed to examine the mineral wealth of Tunis, has paid a visit to the eastern extremity of the isthmus of Gabes, and has formed the conclusion that the inland lake or τριτωνιτη λιμνη of Herodotus was always separated from the Mediterranean in historical times by a belt of limestone rocks, about 200 feet in thickness. M. Fuchs also brought forward other objections, which he expounded at length at a recent meeting of the Academie des Sciences.

The report of the committee formed for the award of the annual prize then follows. They notice the claims of Schweinfurth, Nachtigall, and Ney Elias, to distinction for their important discoveries, but Nachtigall's work being incomplete, and no official account of the other two having appeared at the time the report was drawn up, the committee reserved their verdict on their labours.

Turning to the Far West, the explorations of M. Pinart in the Alaska Peninsula and the Aleutian Islands, attracted the attention of the committee. Alaska belongs to Russian America, geographically speaking, but it was ceded to the United States in 1867. The Russians had discovered it and carried on a trade in furs with the inhabitants, but it had never been properly surveyed. M. Pinart, with instruments supplied by the Smithsonian institute in Washington, determined the height of two volcanoes, Pogrumnoi and Chichaldin, the latitude and longitude of sixteen places, and the latitude only of two places. The minerals and rocks collected by him will introduce modifications in the geological map of Alaska, published by Grewink. The zoological remains have formed the subject of special papers in Paris, the tooth of a fossil elephant in particular exciting interest, for it appears that the melting of the snow, near lake Ilamna, has year by year revealed the existence of extensive remains of the *elephas primigenius*. Many of the articles brought home by M. Pinart, such as stone hatchets, javelins, arrows, dresses, sculptured ivories, masks, &c., shed considerable light on the manner and customs of the people. But it is in ethnology that the richest harvest was reaped. M. Pinart has incontestably proved that the Esquimaux inhabiting this region, are of the same stock as those of Greenland and Baffin's Bay. From their legends, traditions, and songs, he is of opinion that they originally came from a country in the south of Asia, where cold and violent storms, as well as the art of navigation, were quite unknown. After being driven out by their kinsmen, they wandered eastward; a portion settled in the Aleutian Islands and the remainder crossed Behring's Straits, and thence divided into two branches, one branch keeping along the northern shore of North America and peopling Labrador and Greenland; the other stretching along the western coast of the continent as far as Mount Elias. Three races inhabit the north-west extremity of America: the Tinnai or Chippewayan race which extends along the Rocky Mountains as far as the desert of Arizona; they dwell inland on the banks of the great rivers, and subsist by hunting; the Esquimaux, who live mainly on the coast and are fishermen; and, lastly, the Aleutians, who have much in common with the Esquimaux.

In consequence of the great value and variety of M. Pinart's investigations, the committee have awarded to him the gold medal of the Society, and two minor medals to MM. Vivien de Saint-Martin and Emile Levasseur, for their works entitled *Histoire de la Géographie* and *Carte murale de France*, respectively.

Other articles in the *Bulletin* are a sketch of the Kingdom of Siam, by the late Francis Garnier, an account of the finances of the Society, a few reviews, and notes of geographical events.

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